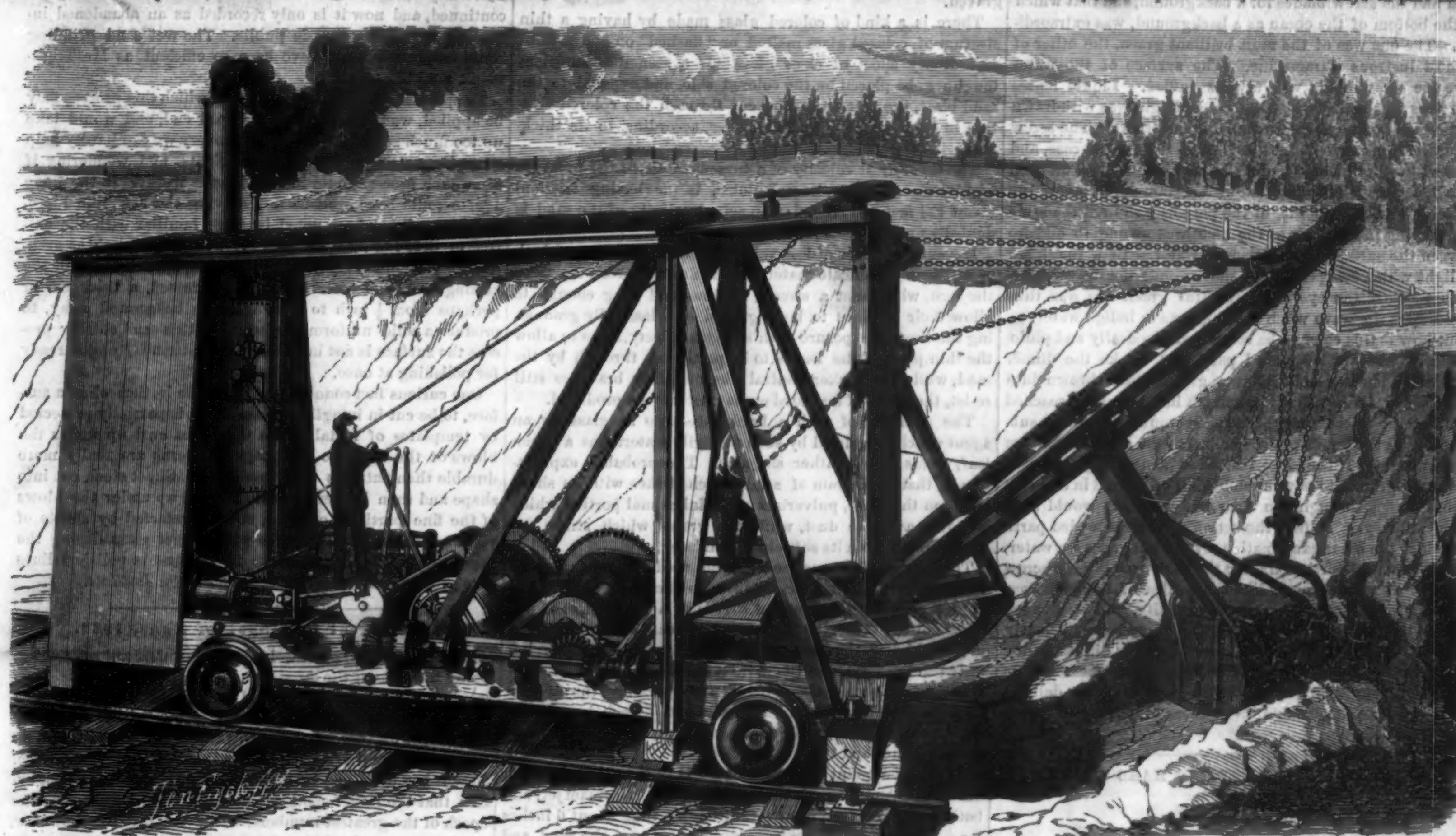
SCIENTIFIC AMERICAN

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. XXIV.—No. 18. [NEW SERIES.] | NEW YORK, APRIL 29, 1871. | $3 per Annum. [IN ADVANCE.]



SAGE & ALGER'S PATENT EXCAVATOR AND DREDGING MACHINE.

Improved Excavator.

While there is probably an ample supply of skilled labor to perform the nicer mechanical and industrial work of the country, there is a lack in agriculture and the ruder operations of railway and canal construction, which keeps wages at a high figure, and compels contractors to adopt any and all practical means to lessen their burdens in this respect.

Excavating for railways and canals has hitherto been generally performed by hand labor. Although there have been machines invented for this purpose, they have not been generally introduced.

Our engraving illustrates a new machine of this kind for which superior advantages, over all that have preceded it, are claimed.

In place of the ordinary crane, a boom is employed, having its lower end attached by a joint to the foot of a short mast, to which the turntable is fastened.

The upper end of the boom is supported by a chain controled by the dipper tender. The end of the dipper handle is firmly attached by a joint to the boom. By raising or lowering the upper end of the boom, the position of the dipper is changed. If it be wished to work carefully to a certain grade in light cutting, by lowering the boom as the engineer winds up the dipper chain, the dipper passes over a long distance, and leaves the surface uniform, working, it is claimed, rapidly, and moving no more material than is required. As considerable distance from the body of the machine can be reached, frequent moving is avoided.

In excavating hard material, other machines have difficulty in holding the mouth of the dipper with sufficient power against the hard surface to make it take hold. In this machine, the forward truck wheels are jacked up slightly from the truck, which holds the body of the machine from retreating, and the dipper holds itself against hard banks, and can be governed to cut just the depth that the power will carry it through.

If the dipper strikes a rock or hidden obstruction that resists removal, the boom is raised and the dipper chain slacked to free it.

The inventors have also an attachment, used in place of the dipper and handle shown, by which hard pan is readily broken up, and prepared for the action of the dipper when the latter is replaced.

When this machine is placed upon a boat, it is claimed to be a first class dredge, and, if required, will, with a short boom, dredge under canal bridges.

When placed upon a pier with a long boom and mast, it will work in deep water to a long distance, depositing the excavated material upon the pier.

It is claimed to be a cheaper machine than any other of the same power. Small sizes can be handled on common roads without removing the machinery. They have been built of weights varying from eight to twenty-four tuns.

We are informed that a coal company has used one with much satisfaction for handling coal, and that another is working very satisfactorily dredging on a southern river. Several are now working in railway excavations.

Expansive friction clutches are used, which obviate shocks to the machinery. The engine is provided with a governor, and other appliances for the economical application of the power.

This machine was patented November 29, 1870, by Clinton H. Sage and Samuel B. Alger. For further information, address the manufacturers, John King & Co., Oswego, N. Y.

COLORS OF THE SEA.

Two distinct series of observations have been brought before you, the one consisting of direct observations of the color of the sea, conducted during the voyage from Gibraltar to Portsmouth; the other conducted in our laboratory below stairs. And here it is to be noted that, in the home examination, I never knew what water I had in my hands. The labels, which had written upon them the names of the localities, had been tied up as you see them here, all information regarding the source of the water being thus precluded. The bottles were simply numbered, and not till all the waters had been examined did I open the labels, and ascertain the locality and sea colors corresponding to the various specimens. I must, therefore, have been perfectly unbiassed in my home observations, and they establish beyond a doubt the association of the green color of sea water with fine suspended matter, and the association of the ultramarine color, and more especially of the black indigo hue of sea water, with the comparative absence of such suspended matter.

Color, you know, resides in white light, appearing generally when any constituent of the white light is withdrawn. Here is a liquid which colors a beam sent through it purple. It cuts out the yellow and green, and allows red and blue to pass through. The blending of these two colors produces the purple. Does the liquid allow absolutely free passage to the red and blue? No. It enfeebles the whole spectrum, but attacks with special energy the yellow and green colors. By increasing the thickness of the stratum traversed by the beam, we cut off the whole of the spectrum. Through the deeper layer, which I now place in the path of the beam, no color can pass. Here, again, is a blue liquid. Why is it blue? Its action on the spectrum answers the question. It first extinguishes the red; then as the thickness augments, it attacks the orange, yellow, and green, in succession; the blue alone finally remains, but everything might be extinguished by a sufficient depth of the liquid.

And now we are prepared for a concentrated but tolerably complete statement of the action of sea water upon light, to which it owes its blackness. Here is our spectrum. This embraces three classes of rays—the thermal, the visual, and the chemical. These divisions overlap each other; the thermal rays are in part visual, the visual rays in part chemical, and *vice versâ*. The vast body of thermal rays is here beyond the red and invisible. They are attacked with exceeding energy by water. They are absorbed close to the surface of the sea, and are the great agents in evaporation. At the same time the whole spectrum suffers enfeeblement; water attacks all its rays, but with different degrees of energy. Of the visual rays the red are attacked first, and first extinguished. While the red is extinguished, the remaining colors are enfeebled. As the solar beam plunges deeper into the sea, orange follows red, yellow follows orange, green follows yellow, and the various shades of blue, where the water is deep enough, follow green. Absolute extinction of the solar beam would be the consequence if the water were deep and uniform, and contained no suspended matter. Such water would be as black as ink. A reflected glimmer of ordinary light would reach us from its surface, as it would from the surface of actual ink; but no light, hence no color, would reach us from the body of the water. In very clear and very deep sea water this condition is approximately fulfilled, and hence the extraordinary darkness of such water. The indigo, to which I have already referred, is, I believe, to be ascribed in part to the suspended matter, which is never absent, even in the purest natural water, and in part to the slight reflection of the light from the limiting surfaces of strata of different densities. A modicum of light is thus thrown back to the eye, before the depth necessary to absolute extinction has been attained. An effect precisely similar occurs under the moraines of the Swiss glaciers. The ice here is exceptionally compact, and owing to the absence of the internal scattering common in bubbled ice, the light plunges into the mass, is extinguished, and the perfectly clear ice presents an appearance of pitchy blackness.

The green color of the sea, when it contains matter in a state of mechanical suspension, has now to be accounted for, and here, again, let us fall back upon the sure basis of experiment. This white plate was once a complete dinner plate, very thick and strong. It is, you see, surrounded securely by cork, and to it a lead weight is fastened. Forty or fifty yards of strong hempen line were attached to the plate. With it in his hand, my assistant, Thorogood, occupied a boat

fastened as usual to the davits of the *Urgent*, while I occupied a second boat nearer to the stern of the ship. He cast the plate as a mariner heaves the lead, and by the time it had reached me, it had sunk a considerable depth in the water. In all cases the hue of this plate was green, and when the sea was of the darkest indigo, the green was the most vivid and pronounced. I could notice the gradual deepening of the color as the plate sank, but at its greatest depth in indigo water, the color was still a blue green.

Other observations confirmed this one. The *Urgent* is a screw steamer, and right over the blades of the screw there was an orifice called the screw well, through which you could look from the poop down upon the screw. The surface glimmer which so pesters the eye was here in a great measure removed. Midway down, a plank crossed the screw well from side to side, and on this I used to place myself to observe the action of the screw underneath. The eye was rendered sensitive by the moderation of the light, and still further to remove all disturbing causes, Lieutenant Walton had the great kindness to have a sail and tarpaulin thrown over the mouth of the well. Underneath this I perched myself and watched the screw. In an indigo sea the play of colors was indescribably beautiful, and the contrast between the water which had the screw blades for a background, and that which had the bottom of the ocean as a background, was extraordinary. The one was of the most brilliant green, the other of the most lustrous ultramarine. The surface of the water above the screw blade was always ruffled. Liquid lenses were thus formed, by which the colored light was withdrawn from some places and concentrated upon others. The screw blades in this case replaced the plate in the former case, and there were other instances of a similar kind. The hue from an indigo sea was always green at a certain depth below the surface. The white bellies of the porpoises showed the same hue, varying in intensity as the creatures swung to and fro between the surface and the deeper water. In a rough sea the light which had penetrated the summit of a wave sometimes reached the eye. A beautiful green cap was thus placed upon the wave when the ship was in indigo water.

But how is this color to be connected physically and philosophically with the suspended particles? Take the dinner plate which showed so brilliant a green when thrown into indigo water. Suppose it to diminish in size until it reached an almost microscopic magnitude. It would still behave substantially as the larger plate, sending to the eye its modicum of green light. If the plate, instead of being a large coherent mass, were ground to powder sufficiently fine, and in this condition diffused through the clear sea water, it would send green to the eye. In fact, the action of the suspended particles, which the home examination revealed in green sea water, is in all essential particulars like the plate, or like the screw blades, or like the foam, or like the bellies of the porpoises. When too gross, or in too great quantity, the suspended particles thicken the sea itself visibly. But when sufficiently small, but not too small, and when sufficiently diffused, they do not sensibly interfere with the limpid greenness of the sea itself. They then require the stronger and more delicate test of the concentrated luminous beam to reveal their presence.—*Tyndall.*

TILGHMAN'S PROCESS OF CUTTING HARD SUBSTANCES.

BY COLEMAN SELLERS.

How to cut or carve, mechanically, hard substances, such as stone, glass, or hard metals, in an expeditious, accurate, and economical manner, has always engaged the attention of engineers. At the present time, the rapidly increasing cost of manual labor makes improvements in this direction more needful. The discovery and utilization of opaque crystalized carbon, cheaper than transparent diamonds, but perhaps equally durable, has gone far in this direction. Now, Mr. B. C. Tilghman, of Philadelphia, comes forward, and shows that a jet of quartz sand thrown against a block of solid corundum will bore a hole through it 1½ inches in diameter, 1½ deep, in 25 minutes, and this with a velocity obtainable by the use of steam as the propelling power, at a pressure of 300 pounds per square inch—a remarkable result, when we consider that corundum is next to and but little inferior to the diamond in hardness.

At the stated meeting of the Franklin Institute, held February 15, 1871, the resident secretary, Dr. W. H. Wahl, introduced this invention, illustrating his description of it by practically cutting or depolishing the surface of a plate of glass by a sand blast of very moderate intensity. Various examples of hard substances cut, depolished, and carved into shape, were displayed. In the discussion which followed the presentation of this very remarkable discovery, Mr. Robert Briggs, in his interesting remarks on the subject, took occasion to say that it had been long remarked that window glass, exposed to the wind-driven sand, near the seashore, soon loses its polish, and cited some other well known examples of the erosion of surface when exposed to a continued stream of moving particles. When we think of the many such examples, and consider that engineers have had continually to make provision against this well known cutting effect, it seems surprising that it should not have been turned to some good account before this.

Mr. Tilghman's attention seems first to have been directed towards cutting stone, or hard metal, by a jet of sand impelled by steam escaping under high pressure. His early experiments were, I believe, with very high pressure, but as he progressed in the knowledge of results obtainable with various velocities, a great use for this process seemed to develope itself in sand driven by moderate air blasts, and applied to grinding or depolishing glass for ornamental purposes.

For grinding glass he uses a common rotary fan 30 inches in diameter, making about 1,500 revolutions per minute, which gives a blast of air of the pressure of about 4 inches of water, through a vertical tube 2 feet high by 60 inches long, and 1 inch wide.

Into the top of this tube the sand is fed, and falling into the air current, and acquiring velocity from it, is dashed down against the sheets of glass, which are slowly moved across, about an inch below the end of the tube. About 10 or 15 seconds exposure to the sand blast is sufficient to completely grind or depolish the surface of ordinary glass; so that sheets of it, carried on endless belts, may be passed under this one inch wide sand shower at the rate of 5 inches forward movement per minute. In the machine in use for this purpose, the spent sand is reconveyed to the upper hopper by elevators, and the dust made by the sand blast (which might otherwise be a source of annoyance to the workmen) is drawn back into the fan, and thence passes with the wind into the blast, and again mingles with the shower of sand upon the glass.

By covering parts of the glass surface by a stencil or pattern of any tough or elastic material, such as paper, lace, caoutchouc, or oil paint, designs of any kind may be engraved.

There is a kind of colored glass made by having a thin stratum of colored glass melted or "flashed" on one side of an ordinary sheet of clear glass. If a stencil of sufficient toughness be placed on the colored side, and exposed to the sand blast, the pattern can be cut through the colored stratum in from about 4 to 20 minutes, according to its thickness.

The theoretical velocity of a current of air, of the pressure of 4 inches of water, he calculates, is (neglecting friction) about 135 feet per second; the actual velocity of the sand is doubtless much less.

If a current of air of less velocity is used, say about 1 inch of water, very delicate materials, such as the green leaves of the fern, will resist a stream of fine sand long enough to allow their outlines to be engraved on glass. By graduating the time of exposure with sufficient nicety, so as to allow the thin parts of the leaves to be partly cut through by the sand, while the thicker central ribs and their branches still resist, the effect of a shaded engraving may be produced.

The grinding of such a hard substance as glass by an agent which is resisted by such a fragile material as a green leaf, seems at first rather singular. The probable explanation is, that each grain of sand which strikes with its sharp angle on the glass, pulverizes an infinitesimal portion which is blown away as dust, while the grains which strike the leaf rebound from its soft elastic surface.

The film of bichromatized gelatin, used as a photographic negative, may be sufficiently thick to allow a picture to be engraved on glass by fine sand, driven by a gentle blast of air.

For cutting stone, the inventor uses steam as the impelling jet; the higher the pressure, the greater is the velocity imparted to the sand, and the more rapid its cutting effect.

In using steam of about 100 pounds pressure, the sand is introduced by a central iron tube, about $\frac{3}{16}$ inch bore, while the steam is made to issue from an annular passage surrounding the sand tube.

A certain amount of suction of air is thus produced, which draws the sand through the sand tube into the steam jet, and both are then driven together through a tube about 6 inches long, in which the steam imparts its velocity to the sand, and finally strike on the stone, which is held about an inch distant from the end of the tube.

At the spot struck a red light is visible, as if the stone were red hot, though really it is below 212° Fah. The light is probably caused by the breaking up of the crystals of the sand and stone.

The cutting effect is greatest when free escape is allowed for the spent sand and steam. In making a hole of diameter but slightly greater than that of the steam jet, the rebounding steam and sand slightly inferfere with and lessen the efficiency of the jet.

Under favorable conditions, using steam which he estimated as equal to about 1½ horse power, at a pressure of about 125 pounds, the cutting effect per minute was about 1½ cubic inches of granite, or 3 cubic inches of marble, or 10 cubic inches of soft brown sandstone.

By means of flexible or jointed connecting tubes, the blast pipe is made movable in any direction; grooves and moldings of almost any shape can thus be made, or, by means of stencil plates, letters or ornaments can be cut either in relief or intaglio, with great rapidity in the hardest stone.

At a high velocity, quartz sand will cut substances much harder than itself, as before stated. With a steam jet of 300 pounds pressure, a hole 1½ inches in diameter was cut through a piece of corundum, 1½ inches thick, in 25 minutes.

A hole 1 inch long and ¼ inch wide was cut through a hard steel file, ¼ inch thick, in 10 minutes, with a jet of 100 pounds steam.

A stream of small lead shot, driven by 50 pounds steam, wore a small hole in a piece of hard quartz; the shot were found to be only very slightly flattened by the blow, showing their velocity to have been moderate.

Among the curious examples of glass, cut by this sand blast, was shown a piece of ordinary window glass, which, having been partially protected by a covering of wire gauze, had been cut entirely through, thus producing a glass sieve, with openings of about $\frac{1}{12}$ of an inch, the intervening glass meshes being only $\frac{1}{16}$ of an inch wide. This seems to have been produced more as a curiosity than for any practical purpose. Should such a sheet of perforated glass be required, it is questionable if it could be produced for a solid sheet by any other method.

A microscopic examination of the sheet glass, depolished by this process, shows a succession of pits formed by the blows of the impinging grains of sand, and looks more uniform than do surfaces ground by any rubbing process.

This steam sand jet has already been introduced to clean cast iron hollow ware, previous to tinning the interior. Heretofore, the interior surface has been turned, it having been found necessary to remove a thin shaving in a lathe to obtain a clean surface. The surface is cleaned more rapidly by the sand blast, and even more perfectly, because it penetrates into any holes or depressions which the turning tool could not reach. It is also probable that the sand striking the particles of plumbago, which separate the particles of metallic iron in ordinary gray cast iron, will remove them, and thus expose a continuous metallic surface to take the tin.

In this relation I might note, that about twenty-five years ago, some experiments were made in Cincinnati, at the establishment of Mr. Miles Greenwood, by my brother, Mr. George Escol Sellers, with a view to making tinned hollow ware of ordinary gray iron. He made a machine for scouring the inside of the pots and kettles with sand and water; afterwards the still wet, scoured surfaces passed into the chloride of zinc solution, and thence into the molten metal, and were uniformly turned. For some reason, the process was not continued, and now it is only recorded as an abandoned invention, never before made public. The wet sand grinding could not, in this case, have been so efficient as Mr. Tilghman's sand blast.

To speculate on the various uses to which this process may be applied, would not serve any good end, and would take up too much space. With this discovery we can hardly help recurring to the works of the ancients, and wondering if some such process could have aided the workers in the stone age, or could have been used in carving the Egyptian hieroglyphics. It has been noted by those familiar with the cutting or dressing of stone, that some materials, such as granite, are very much injured or "stunned" by the blows of the cutting tool, and after being hand dressed, a thickness or perhaps from ½ inch to ¼ inch has to be ground away, to produce a solid uniform surface. By this sand cutting process the surface is not injured, is not "stunned," and is ready for polishing at once.

One curious fact connected with its use is, that when a surface, to be cut in intaglio or otherwise, is partially protected by templates of metal, these templates curl up under the blows of the sand, so that paper patterns are really more durable than patterns cut from brass. Sheet steel, cut into shape and then hardened, will also curl up under the blows of the fine particles of sand, unless protected by sheets of yielding material. Fine lace will protect glass during the depolishing process, and leave its designs in polished lines on a ground surface.—*Journal of Franklin Institute.*

The Great Sun Spot of June, 1843.

Prof. Daniel Kirkwood, in *American Journal of Science*, writes that one of the largest and most remarkable spots ever seen on the sun's disk, appeared in June, 1843, and continued visible to the naked eye for seven or eight days. The diameter of this spot was, according to Schwabe, 74,000 miles; so that its area was many times greater than that of the earth's surface. Now it has been observed, during a number of sun spot cycles, that the larger spots are generally found at or near the epoch of the greatest numbers. The year 1843 was, however, a *minimum* epoch of the eleven year cycle. It would seem, therefore, that the formation of this extraordinary spot was an anomaly, and that its origin ought not to be looked for in the general cause of the spots of Schwabe's cycle.

As having a possible bearing on the question under consideration, let us refer to a phenomenon observed at the same moment, on the first of September, 1858, by Mr. Carrington, of Redhill, and Mr. Hodgson, at Highgate. "Mr. Carrington had directed his telescope to the sun, and was engaged in observing his spots, when suddenly two intensely luminous bodies burst into view on its surface. They moved side by side through a space of about thirty-five thousand miles, first increasing in brightness, then fading away. In five minutes they had vanished..... It is a remarkable circumstance, that the observations at Kew show that on the very day, and at the very hour and minute of this unexpected and curious phenomenon, a moderate but marked magnetic disturbance took place; and a storm, or great disturbance of the magnetic element, occurred four hours after midnight, extending to the Southern hemisphere."

The opinion has been expressed by more than one astronomer, that this phenomenon was produced by the fall of meteoric matter upon the sun's surface. Now this fact may be worthy of note, that the comet of 1843, which had the least perihelion distance of any on record, gradually grazed the solar atmosphere about three months before the appearance of the great sun spot of the same year. The comet's least distance from the sun was about 65,000 miles. Had it approached but little nearer, the resistance of the atmosphere would probably have brought its entire mass to the solar surface. Even at its actual distance, it must have produced considerable atmospheric disturbance. But the recent discovery that a number of comets are associated with meteoric matter, traveling in nearly the same orbits, suggests the inquiry whether an enormous meteorite, following in the comet's train, and having a somewhat less perihelion distance, may not have been precipitated upon the sun, thus producing the great disturbance observed so shortly after the comet's perihelion passage.

THE locomotive which George Stephenson constructed in 1814 would travel only four miles an hour. In 1825, six miles an hour was the standard speed.

SOMETHING ABOUT SEEDS.

BY W. W. BAILEY.

The seed of Asclepias, milkweed, is thin, flat, and of a brownish tint. The embryo is devoid of that store of albumen which many plants provide for the early sustenance of their young. It, with its fellows, is imbricated upon a papery placenta, its plumy tufts reposing in gill-like processes of the same until the perfection of the fruit, when they become disengaged by the lightest touch, and waft the attached seed to its destined resting place. Nothing can be more soft and satiny than is the so-called coma of Asclepias. Under the microscope the hairs are found to be exceedingly smooth and regular in outline, and undistinguished by the spiral twisting which characterizes many similar fibers. The evident design of the plumes, as in other cases where seeds are provided with such appendages, is to assist in the wide spread distribution of the species. Many seeds probably fall quite near the parent plant, but chance breezes often carry others to a very great distance.

As every one knows, the dandelion (Taraxacum), the groundsel (Senecio), the thistle (Cirsium and Onopordon), and many other genera of Compositæ, the willows (Salicaceæ), some of the buttercups (Ranunculaceæ), the evening primrose family (Onagraceæ), together with members of many other orders, are similarly endowed with silky tufts to assist the seed in its migrations. The execution may differ in diverse species, but the plan remains the same. This is the commonest, yet other methods are adopted to obtain the same end, as we notice in the key like samara of the maple and the wing-seeds of the trumpet creeper (Tecoma radicans), of the pines and the elms. All these are charming objects when viewed by the unassisted eye, or more closely examined by means of the microscope.

Some plants, like the balsam (Impatiens) and the geranium by a sudden contraction of portions of the capsule, expel the contents with a jerk, which often throws them to a considerable distance. Others are provided with little hooks, claws, fine hairs or some other mechanical means of attaching themselves to moving objects and availing themselves of their involuntary aid. There is no American botanist, probably, but has expostulated mildly with the chain like pods of Desmodium, which will persist to adhering to one's clothing, and the removal of which is no small task. The barbed achenium of Bidens frondosa is another pest to man, as are the burrs of Lappa major or burdock, to sheep and cattle, but we must bear in mind that in the case of these plants, we are merely mediums of conveyance, and have temporarily resigned our proud position at the head of nature.

Animals and birds often distribute seeds which have passed through the system undigested; currents of water in the ocean bear them from one island or continent to another, while commerce, often unintentionally, scatters them over distant lands. In this latter way, many of the most pernicious weeds have spread from Europe into Australia, America and India, where they make themselves perfectly at home and evince frequently even more vitality than the native plants. To take one or two instances of the peculiar method of spreading, the Rudbeckia hirta is said to have come into New England with hay seed from the West, and is evidently increasing; while in New Brunswick I have heard it claimed that the white weed (Leucanthemum vulgare) has spread with other Yankee notions from the neighboring states. It has certainly proved a successful invader and has taken possession of half the cultivated country.

I cannot refrain from inserting here a note from Sir J. E. Tennent's "Ceylon," in relation to the curious seeds of *Spinifex squarosus*, the "water pink" as it is sometimes called by Europeans.

"The seeds of this plant are contained in a circular head, composed of a series of spine like divisions, which radiate from the stalk in all directions, making the diameter of the whole about eight or nine inches. When the seeds are mature, and ready for dispersion, these heads become detached from the plant, and are carried by the wind with great velocity along the sands, over the surface of which they are impelled by their elastic spines. One of these balls may be followed by the eye for miles as it hurries along the level shore dropping its seeds as it rolls, which speedily germinate and strike root where they fall. The globular heads are so buoyant as to float lightly on the water, and the uppermost spines acting as sails, they are thus carried across narrow estuaries to continue the process of embanking on newly formed sandbars. Such an organization irresistibly suggests the wonderful means ordained by Providence to spread this valuable plant along the barren beach to which no seed devouring bird ever resorts; and even the unobservant natives, struck by its singular utility in resisting the encroachments of the sea, have recorded their admiration by conferring on it the name of Maha-Rawana-raewula, 'the great beard of Rawana or Rama.'"

As to the duration of seeds, there are many conflicting accounts. All are familiar with the old story of the grain found with Egyptian mummies, which vegetated after its disinterment and gave rise to a peculiar kind of wheat. This was a pleasant tale with which to point a moral, but it is now discredited by those most familiar with the facts. Still, it holds its place in many popular books, and shows the ease with which incorrect statements may gain credence, and with what difficulty they are refuted when once proclaimed. That some seeds do live for a long time cannot be doubted, but no such extreme limit is authenticated as that cited for the mummy wheat. There are too many opportunities for error and even fraud, where a story is received at second hand from the Arabs. The largest of the accepted statements look a mite apocryphal. With most seeds the principle of life is evanescent, and it is with extreme difficulty that many can be transported from one climate or country to another. Even those that preserve their appearance unchanged and remain suitable for food, are often found to have lost their power of germination. The conditions necessary for the retention of vitality are not as yet certainly known, but it is thought that a particular amount of dryness together with the exclusion of light and air, are essentials to success.

The total amount of seed produced by some plants is very remarkable. Linnæus says that a single stem of tobacco yields forty thousand seeds, and we all know how well provided with them are our commonest plants.

With the beautiful colors often assumed by seeds, all are of course acquainted who in childhood have arrayed the gaily tinted beans in military order. Nearly all the primary colors are brought into play to ornament the different seeds, while some, more regal in their fancies, are bedecked with bronze and gold.

There are many seeds that are not edible, and others that are extremely noxious. The most deadly substance known, perhaps is prepared from the seed of *Strychnos nux-vomica*.—*American Naturalist.*

Co-operative Cheese Making in the United States.

At a recent meeting of the Swindon (England) Chamber of Agriculture, Mr. W. F. Parsons said that "dairy farming in America represents a capital of more than six hundred millions of dollars. The year 1841 was the first in which cheese was imported in any quantity from the United States. It is now nearly 500,000 cwts. It was then looked on with contempt by English makers, who confidently predicted that it would never successfully compete with the best quality here.

"The idea of associated dairying seems to have originated in Switzerland. Swiss peasants, each owning one or two cows, unite them in a herd, employ a herdsman, who takes them to the mountain passes of the Alps, watches them, and with the help of assistants makes cheese from their milk, which, at the close of the season, is divided among the owners of the cows, according to the number furnished by each. Only on such a system could cheese be made from one or two cows.

"Associated dairying, as it exists in America, is a widely different affair. What distinguishes the system there, is the constant effort to reduce the pursuit to a science. The popular method of organizing factories, and one that seems to give the greatest satisfaction, is to make them joint-stock affairs. The ground is selected, an estimate made of buildings, machinery, and fixtures, then the whole cost is divided up into shares of $50 or $100 each (£10 to £20). The neighboring farmers, or those favorable to the movement, take stock in proportion to the number of cows from which they are to deliver milk. Officers are chosen, and the company managed on the joint-stock principle. Usually, some one of the party is selected as salesman, who makes sale of cheese at best prices, makes up dividends, and pays over shares to 'patrons' whenever a sale is effected, deducting, of course, the price of manufacturing, which is fixed at a point to cover any expenses, including 10 per cent on cost of buildings and fixtures. A good cheese manufacturer is employed either at a salary or at a certain price per pound of the cheese made. The milk is weighed at the factory as it is delivered, as experience has shown that every 10 pounds of milk will, on an average throughout the season, make one pound of cured cheese. The manager is employed with the understanding that he is to make a good article, and his product is examined from time to time by committees of the company and experts, and by farmers when they deliver milk, if they choose, and hence any mismanagement is soon discovered. There is another method by which one man, or a company, erects buildings, and is at the expense of running the factory, charging by the pound for manufacturing. The advantages of the plan under discussion to-day are—first, economy of production; and, secondly, superiority of produce. According to Dr. Voelcker, by utilising whose scientific teachings the Americans have attained their success, 'an ordinarily careful and active manager ought to be able to make good cheese under all circumstances, no matter from what kind of pasture the milk came, in what weather the cheese was made, or in what part of England the factory was situated.'"

A long discussion ensued on Mr. Parsons' paper, the general tone of which appeared favorable to the opinions therein enunciated, and eventually a vote of thanks was accorded to that gentleman for bringing the subject forward.

Fog Signals.

At a recent meeting of the Institution of Civil Engineers, in London, a paper was read "On Phonic Coast Fog Signals," by Mr. A. Beazeley, M. Inst. C. E. Of this paper, the following is an abstract, taken from *Engineering*:

The coasts of these islands being liable to fogs and mists, it was surprising that the subject of fog signals, for the guidance and warning of the mariner under such circumstances, should have received so little attention; and beyond an occasional notice or a brief suggestion among scientific journals, there were no traces of systematic research and experiment. It was by some supposed, that great power and long range of sound were not essential to fog signals, inasmuch as it was said that fogs usually occurred in comparatively calm weather. This, however, was not the case, so far, at least, as regarded the coasts of Great Britain; for in the years 1868-69, fogs prevailed on the Yorkshire coast fifty-one times, at the entrance of the Bristol Channel one hundred and twenty-five times, and near Holyhead one hundred and seventeen times, with a total duration of 254½, 713¼, and 698¾ hours respectively, when the strongest winds were from the seaward, and varied in force from a mean of 4·55 and a maximum of 8 on the eastern coast, to a mean of 4·47 and a maximum of 9 on the western coast. But even where fogs were not usually attended by high winds, the necessity of power and range in fog signals was in no way diminished; for a heavy snow storm, a thick driving sleet and rain, which often accompanied a gale of wind, were quite as blinding and bewildering as the densest fog.

In 1863, a Committee of the British Association memorialized the President of the Board of Trade, with a view to induce him to institute a connected series of experiments as to the effect of fog upon various sounds. It was then shown that the laws which governed the action of fogs in deadening sound were at present so imperfectly understood, that such a thorough and scientific inquiry was much to be desired, and was, in fact, essential to any real addition to the knowledge of the subject; without which, all investigations of isolated cases were little better than a vague groping in the dark. It was also pointed out that experiments during clear weather could not be accepted as affording satisfactory evidence of the value of any signal during fog.

It was stated that the instruments in use for fog signals were gongs, bells, guns, whistles, and trumpets—the two latter sounded either by steam or by condensed air—and a detailed description was given of these several appliances—whether in use or proposed—and of the experiments that had been tried to ascertain their efficacy.

In conclusion it was remarked that upon a review of the various fog signals which had been mentioned, it was found that the whistle and the trumpet stood out prominently as regarded power and manageableness. Guns, besides their heavy working expenses, had the disadvantage of requiring a longer interval between the signals, and of entailing continuous work upon the attendant. It appeared, therefore, that it was to the improvement and the augmentation of power of the two former, that a more efficient instrument must at present be chiefly looked for. Whatever might be the fog signal adopted in practice, power of sound and certainty of action were indispensable conditions. Better, it had been said, no signal at all, than one that could not be relied upon; and, undoubtedly, if the mariner were led to expect a signal at a certain place, and at a sufficient range to insure time to act upon its warning, it ought to be so heard with unfailing certainty. Among existing signals there were some which, in ordinary fog and moderate weather, would fulfil these requirements: but it was doubtful how far they would act to windward against a heavy gale. The howling of the wind, the groaning and creaking of the hull and spars, the shock and roar and thunder of the sea, the drenching, blinding spray, the fierce blast, the thick mist—those were the antagonists against which the fog signal would have to try its powers; and powerful indeed must be its voice, if it afforded in time a friendly warning.

One difficulty in the way of employing, at rock lighthouses, any fog signal but a bell, or such other instrument as could be sounded by the application of simple clockwork, was the unsuitableness of such buildings for the reception and working of a steam or caloric engine, and the severe labor which would be entailed upon the keepers by the use of powerful machinery worked by hand. But the author still entertained the opinion, which he formed sixteen years ago, that the vast dynamical power afforded by the rise and fall of the tide would yet be utilized and applied to the compression of air for the purposes of fog signals at such stations.

The Shape of Saw Teeth.

The adaptation of tools, in form and construction, to the nature of the work required of them, says *Leffel's Mechanical News*, is an important item in every branch of mechanical industry, and in none more vitally than in the sawing of lumber. The distinction to be made according to the direction in which the saw is to run, whether across the grain or with the grain, is sufficiently plain, and is familiar to every workman in a saw mill. As the fiber of the wood to be severed in cross cutting presents a firm, almost unyielding resistance to the saw, the teeth are of an acute or lancet-like shape, cutting the wood rapidly asunder, as if with a succession of knives, and producing a fine granular sawdust; while the teeth of the rip saw, cutting with or rather separating the grain, are made comparatively large and coarse, encountering less resistance from the wood, which they tear into small chips or shavings. The experience of workmen in soft and especially in gummy or resinous woods, such as pitch pine, larch, etc., gives still more striking proof of the necessity of adapting the saw to the nature of the material in which it is to operate. To prevent the choking of the saw, and a resulting demand for additional power to maintain the motion, the points of the teeth require to be made acute and to have considerable pitch, in order to overcome the obstruction of damp sawdust accumulating in their path; and in gummy wood, an application of grease is often necessary, as a remedy for the heating and friction caused by the tendency of the resin to adhere to the saw.

It may be stated, in general terms, that for soft or yielding woods, of the class of which the willow and pine are common examples, the pitch should be greater, and the teeth large and acutely pointed. For mahogany, rosewood, and other woods of tough and dense fiber, teeth of less size and of perpendicular pitch are appropriate. The principle which should govern the shape of saw teeth is indeed an extremely simple one, and would seem to require no formal statement, more especially as it is certain to make itself manifest, if disregarded, upon a brief experiment. In practice, however, it often fails to receive due attention, and no small amount of inconvenience and actual loss is occasioned by neglect of this material point.

COCHINEAL INSECTS AND THEIR ALLIES.

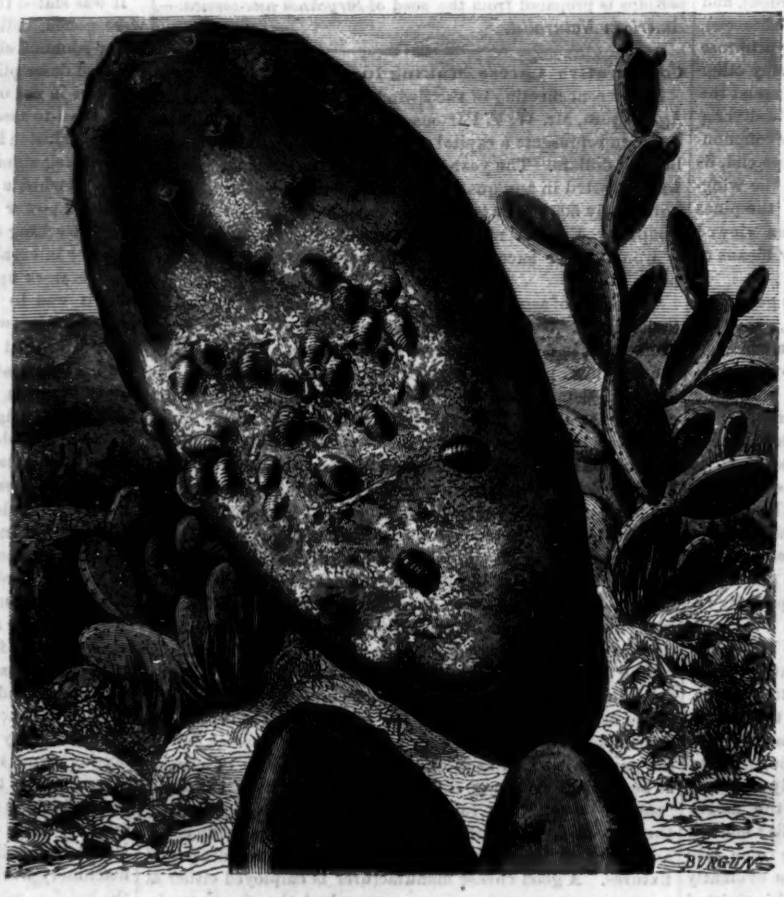
BY PROFESSOR E. C. H. DAY.

Plant lice and bark lice are among the naturalists' most puzzling conundrums. Insignificant as they are, aphides have been a perturbing element in biology, and have helped to cause a revolution in scientific thought; and they illustrate, in a wonderful manner, the variety of Nature's ways and her unfailing resources. We know that plants, their life being devoted, in even the highest instances, to nothing more than growth and reproduction, possess these powers in many, and sometimes all, parts of their structure. It is not necessary that they should produce flowers and fruit, and that there should be a development of male and female elements, whose subsequent union should give rise to seed containing the germ of a new individual. The plant may renew its own existence by every bud, and may continue to propagate itself, at least for a time, without any manifestation of sexual character. But in the animal kingdom, in the members of which the mere vegetative conditions of life become altogether subservient to sensation and intelligence, reproduction by means of buds appears as an exceptional phenomenon, except among the lowest forms, in which a plant-like absence of sensation is frequently accompanied by a plant-like want of the power of free locomotion. It was therefore deemed an astonishing discovery when it was found that, in a colony of plant lice, the multiplication of the species was carried on, from generation to generation, for many successive generations without the appearance of any males. The reproducing forms were at first regarded as true females, but subsequently it was suggested, that the young of the original females are of the nature of buds, and that this system of reproduction, therefore, consists rather in the development of a series of such buds, than in the production of entirely new individuals. According to this light, the series of such offspring, be they even reckoned by millions, are rather successional and oft-multiplied parts of one, than so many generations of different, individuals; and a new generation only appears when males, at the end of the season, again come into existence and give rise to a family according to the ordinary law of animal reproduction.

It seems almost useless to speculate on any special purpose in this extraordinary method of multiplying animal life. Why should a cuttlefish bud out an arm which eventually becomes its male representative? Why should a lizard occasionally bud forth an extra tail, or a human being an extra thumb? Still more useless is it to seek in these anomalous acts of Nature for purposes special to man; in fact, the entire order of the hemiptera, or bugs, is a commentary upon the futility of the questions so frequently asked, and already alluded to in a former paper. Of what use are many of the productions of Nature to man? Is it for the purposes of man at all, that they have been called into being? We should not be surprised to hear some one deeply interested in establishing man's "divine rights" to all the ends of Nature, reply that plant lice were created as a check upon the pride of science, as a part of the punishment of Adam's original sin, and that certain bark lice were similarly designed to gratify at once female vanity and men who have an eye to color. Unfortunately for such an argument, the naturalist must believe that bark lice wasted carmine before there was a human being to extract the dye, that aphides checked the growth of plants before gardeners ever thought of forcing them, and perpetuated their race in the most irregular manner before a Greek had even invented the words combined in "Parthenogenesis." At first sight, we may even be inclined to think that, as far as any, even indirect, bearing on the human welfare is concerned, the whole group of bugs might have been advantageously omitted from the scheme of the universe. We could well afford to sacrifice cochineal to have our favorite plants and trees free from aphides; and to have been untortured by bedbugs, we should have contentedly remained in eternal ignorance of their enemy, the Reduvius, a kindred bug, that has the bad taste to feed upon them. But such a view is narrow. Had the bugs been omitted in the insect department of the Universal Scheme, that scheme would not have been complete and perfect; why, or wherefore, we cannot exactly see. The whole reason is as far beyond our ken as the entire design is beyond our comprehension, but we may be convinced that it must be so, or all the lessons of the Universe have no meaning.

As man himself is part of the great scheme, he shares in the general results of its perfection; and he may always console himself, that if a particular natural object seems of no use to his very important self, yet that it undoubtedly has its significance in the designs of his Creator. One effect of this peculiar budding process among the aphides is, that they multiply with a rapidity almost inconceivable. Fitch says: "It is reported of the insects of this family, that there are from sixteen to twenty generations in the course of the season—from twenty to forty young being produced from each parent. Thus, from one egg, as stated by Mr. Curtis, in seven generations, seven hundred and twenty millions of lice will be bred." "Such is their fecundity, that if no check were given them, it is evident that from the cedars of Lebanon to the hyssop upon the wall, every leaf and spear of vegetation springing from the bosom of mother earth, would be thronged and blighted by the countless myriads which would be produced in the space of a few months." He adds: "We accordingly find that the aphides have enemies more numerous, active, and inveterate, than any other group in this department of the works of nature. Whole families of other insects, some of them numerous in species, appear to have been called into existence chiefly for the purpose of feeding upon and destroying these vermin. And an acquaintance with the several kinds of insects, which, in our country, occur in company with these pests of vegetation, is quite important, that we may know which to destroy or pass by in indifference, and which to cherish and protect, and call to our aid, in instances where Nature herself does not furnish them in sufficient numbers."

On the other hand, these same aphides present us with the extraordinary spectacle of insects of another kind carefully protecting them, caring for them with the most assiduous instinct, and receiving in return a coveted secretion, the honey dew, which the aphides discharge. It was no fabulous tale that originated the name for these diminutive beings of "the ants' milch cows." As your milkmaid draws milk from the sweet-breathed kine, so does an ant, gently titillating with its antennæ an aphis, induce the latter to discharge its secretion; and as your herdsman keeps off the bear and the wolf, and conducts your cows from pasture to pasture, so do the ants drive away the enemies of the helpless aphis, and even carry it tenderly from an exhausted to a fresh and juicy leaf.



FEMALE COCHINEAL INSECTS.

But the wonders of the life history of the aphis have nearly made us forget the subject of our present engraving, which represents a group of the female cochineal insects upon a leaf of the nopal, upon which they are "cultivated" and protected by human beings, with a care almost rivaling that just recorded of the ants. We must, however, reserve our description of the cochineal insect for our next contribution.

The Supposed Fungoid Origin of Cholera.

In the year 1866, Hallier discovered, in cholera discharges, yellowish colored cysts, of spherical or oval form, inclosing yellowish shining spores, varying in size; also, groups of swollen spores, surrounded by minute molecular matter (so called *micrococcus*), proceeding apparently from the rupture or breaking up of spores.

These minute molecules were seen to adhere to various objects in the fluid, on which they appeared to feed; they exhibi ed signs of germination, grouping, filamentary arrangements, and, finally, branching filaments with *macroconidia* and *cysts*, the relations of which to each other were considered as established by cultivation experiments. The resulting fungus, a *polocystus*, was considered by Hallier to resemble the rye fungus in Europe, and probably to be present in diseased rice in India; and he held that this fungus, introduced into the intestinal canal and there passing through the various stages of its existence, caused the phenomena of cholera, by its action on the intestinal epithelium.

Here Dr. Lewis's work begins, and every step in it is illustrated by microscopic slides. He shows that minutely divided matter is not more prevalent in choleraic than in other discharges, indeed, less so; but that attempts to produce "*micrococcus*" by cultivation had entirely failed, possibly on account of the many sources of fallacy in such experiments He gives the results of a number of observations made with infusions and decoctions of animal matter, including cultivations with cholera discharge, and shows that in spite of every care in the manipulations, very different forms of life will make their appearance in substances derived from the same source, and under apparently identical conditions. His general conclusions on this first stage of the inquiry are:

1. That no cysts exists in choleraic discharges which are not found under other conditions. 2. That cysts, or "sporangia" of fungi are very rarely found, under any circumstances, in alvine discharges. 3. That no special fungus has been developed in cholera discharges, the fungus described by Hallier being certainly not confined to such. 4. That there are no animalcular developments, either as to nature or proportionate amount peculiar to cholera, and that the same organisms may be developed in nitrogenous material, even outside the body. Lastly, that the *débris* of intestinal epithelium is not of this origin, but appears to result from effused blood plasma.

Unless these conclusions are materially modified on subsequent inquiry, they must be considered as disposing of Hallier's theory of cholera. Should, however, Dr. Lewis's further investigation prove that Hallier's fungus is present in choleraic discharges, and in diseased rice, as a *constant*, we should require scientific proof that cholera was caused by the action of this fungus, and by nothing else.

Pettenkoffer's theory of cholera connects the prevalence of the disease with certain conditions of damp subsoil, and subsoil water, and with the presence of a "germ," favorable meteorological conditions, and personal predisposition. Little has been done, as yet, in this portion of the cholera inquiry. What has been done is very interesting, although it does not support the theory. The subsoil water experiments do not appear to sustain Pettenkoffer's views, but the examination of soils has yielded several important scientific facts of general interest The amount of air, in specimens of soil taken at different stations, varies from 33 to 66 per cent by measure. The amount of organic matter in soils, when compared with the amount, weight for weight, in the water at the same stations, is from ten to twenty times greater; one instance is given in which it was forty times greater. But the most interesting scientific facts are those connected with the development of lower forms of life in infusions of soils in water. Besides a few *algæ*, the prevailing forms are *Monas lens, Paramecium, Monera* assuming the most fantastic outlines, *Vibriones, Amæba, Englenæ*, etc.

We look forward with great interest to further instalments of this important inquiry, which we trust may add largely to our knowledge, and by this means enable human life to be saved.—*Nature.*

A New Wonder.

Yesterday morning April 9th, Mr. J. B. Knight, agent of the Watertown Steam Engine Company, sunk a drove well in rear of his office, with a view to getting a supply of water; and when at the depth of forty-six feet, a sudden and very powerful draft of gas was observed to flow from the mouth of the pipe. He immediately clo ed the pipe, thinking to utilize this gas for illuminating purposes, but found the pressure too great; when the idea struck him to direct it into the boiler of one of his engines and experiment with it in making steam. But no sooner had the connection been made than the engine began to run entirely by the pressure of the gas acting upon the piston, at a pressure of twelve pounds to the square inch; and so it continued all day yesterday, giving no sign of exhaustion.

Here is a discovery. A motive power which costs absolutely nothing, sufficient to be made available in running many kinds of light machinery, perfectly controllable and seemingly inexhaustible. What shall we find next under our city?—*New Orleans Republican, April 9th.*

Says the *New Orleans Times* of the same date:

A great curiosity is to be seen at J. B. Knight's machinery establishment on Carondelet street, near Poydras. No less than a stationary steam engine, running without steam. Mr. Knight, having had occasion last week to bore for water at the depth of forty-seven feet, encountered a flow of natural gas, with such a pressure that on attaching it to the engine with a flexible pipe, it drove it with ease. When we witnessed it in operation, the gage marked a pressure of twelve pounds to the square inch, and the gas from the discharge pipe was burning brilliantly. An engine, apparently furnishing its own power, and a brilliant light to see it by, comes nearer to the realization of a perpetual motion machine than any yet reached.

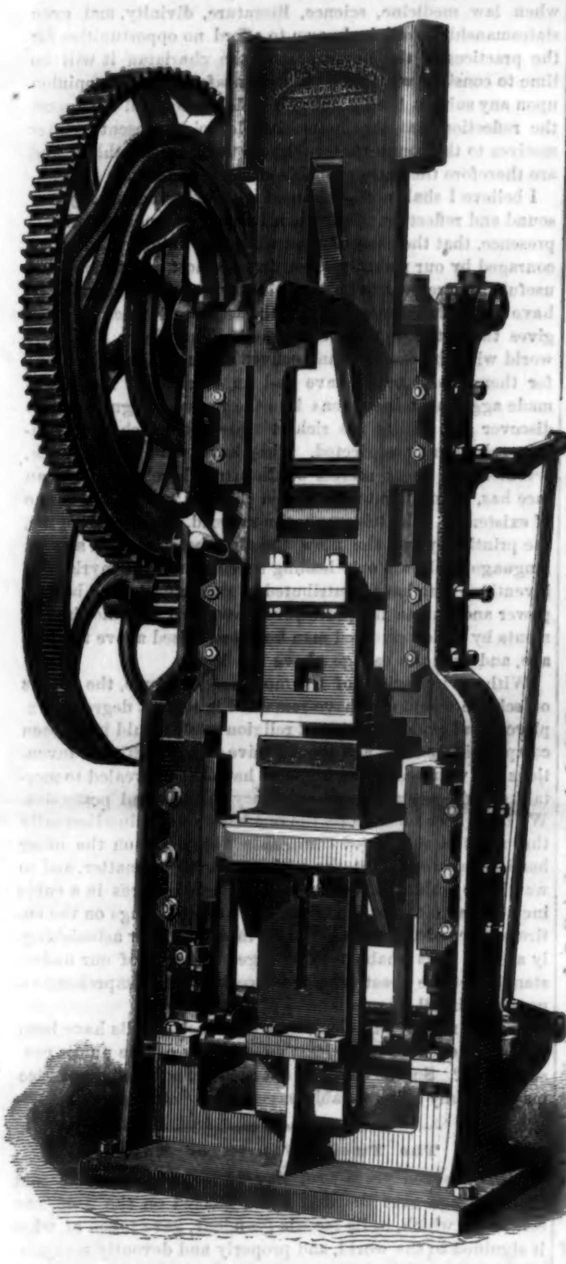
RAILROADS IN IOWA.—The unprecedented rapidity with which our railroad system is being extended is well shown in some statistics which we have received from Iowa. In the last eight years, no less than two thousand miles have been constructed in that State, of which more than one thousand have been made in the years 1869 and 1870. The railroads of Iowa are 2,683 miles long, and the gross earnings for the the past nine years about $50,000,000.

MOLDING AND MIXING MACHINES, USED BY THE UNION STONE COMPANY--THE SOREL PROCESS OF MANUFACTURING ARTIFICIAL STONE.

The main features of the Sorel process of manufacturing artificial stone were laid before our readers in an article published on page 263, Vol. XXIII. The patent for the process is owned by the Union Stone Co., of Boston, and the stones made by it are, as noticed in our previous article, of great variety. We are told that the demand for them is constantly increasing.

The base of the "Union Stone," as it is now called in this country, is the cement invented by M. Sorel, of France, depending upon the property possessed by magnesia, of forming with the chloride of the same base, an insoluble compound.

These substances, when mixed together in proper proportions, the chloride being in solution, soon become solid, or set so as to retain the form of the mold or vessel in which they are mixed; and, the process of solidification continuing, they become eventually as hard as the hardest marble.



The resulting substance is the whitest and hardest of all cements. By combination with mineral colors, it may be made to assume any desired tint, may be molded like plaster, and be employed in the manufacture or imitation of innumerable objects of art or ornament.

In practice, the cement is never used in a pure form, but in combination with other materials; which, being incorporated with it while in the moist condition, are in the subsequent setting chemically bound together into a solid mass.

For this purpose, the magnesia, in fine powder, is mixed with mineral substances, such as sand, gravel, dust or chips from marble or other stones, or with emery, quartz, or other grits of various kinds, in varying proportions, according to the result desired. This mixture is then moistened with a solution of the chloride of magnesium, or with the bittern from salt works.

In some cases it is made sufficiently wet to form a mortar, and in others only to produce a condition of dampness like that of molding sand. The mixture may be effected in troughs, by hand labor, the materials being worked over with shovels or hoes; or, more expeditiously, in mixing machines designed expressly for the purpose, and worked by horse or steam power.

Those in use by the Union Stone Co. were invented by Mr. J. S. Elliott, and are capable of mixing thoroughly about two tuns per hour. The mixer consists principally of a vertical cylinder of iron, divided horizontally by a slotted diaphragm, in the axis of which an iron shaft revolves, carrying horizontal arms. The arms are movable, up and down, on the shaft to allow relief when coarse pieces get in, but are ordinarily held in place by a strong spiral spring. The slotted diaphragm sustains the mass of materials, so that they may not pack heavily by their own weight; and it assists in cutting in pieces and grinding any lumps, and gives double effect to the machine.

The materials, roughly compounded, are thrown into the upper part of the cylinder; and, in their descent, become thoroughly mixed and ground together by the revolving arms; and, after passing through the slotted diaphragm, emerge at the bottom. The material, as it comes from the mixing machine, may either be placed in molds of iron or wood of the proper shape, or spread out in slabs or sheets, when it soon sets and forms a hard stone.

When designed to be formed in molds, it should be brought to the consistency only of molder's sand, and then consolidated into the mold by means of tampers; percussive force being better than steady pressure. The mold may then be immediately withdrawn, when the mass will retain its form, and may be left to harden.

The machines in use by the Company, for taking off large quantities of blocks of a given shape, are known as "Elliott's Patent Artificial Stone Machines," described below; and are quite extensively in use for making building blocks of hydraulic cement, lime, and sand. A few modifications to meet the requirements of the Union Stone Co. have been made.

The materials of which this cementing substance is composed, are abundantly distributed over the surface of the globe. Magnesia sufficiently pure for the purpose is obtained by simply calcining mineral magnesite, large deposits of which are known to exist in Prussia, Greece, Canada, California, Pennsylvania, and Maryland. Deposits will doubtless be found in other places when the demand is made for the material.

The chloride of magnesium is readily obtained by concentrating sea water, the bittern of salt works being sufficiently pure for the purpose. Sea water concentrated to 30° B. precipitates nearly the whole of its chloride of sodium. In the "Sorel" process, it is concentrated to 33° B., when all the chloride of sodium is practically crystallized and precipitated, the mother liquor retaining, besides the chloride of magnesium, some chloride of potassium, and some sulphate of magnesia, which seem to add strength to the cement, as the water in this state makes a stronger stone than the pure chloride of magnesium.

We herewith give an illustration of the molding machine. The hopper, partially shown in the rear of the machine, having been filled with the prepared materials, the machine is set in motion, and a feeder, capable of containing enough of the materials to form the proposed article, is carried first under the hopper to receive its charge, and then under a ram. The bottom of the feeder is then withdrawn, and the ram strikes a blow down upon the materials, forcing them into a mold, and partially condensing them. The blow is repeated, and the ram is raised for a third blow; and, at the same time, the feeder is carried back under the hopper for another charge. A third blow is then struck by the ram, which then rises, and is held still and firm while the core is withdrawn downward, and the mold is pressed upward against the face of the ram, pushing out the molded article upon a table advanced to receive it, which table then carries the article to the front of the machine. The whole process is automatic, and repeated indefinitely, the motions being derived from a series of cams, shown at the left in the engraving.

The machine will, it is claimed, make 3,000 building blocks per day with single ram, or nearly double that amount with double ram. Each of the blocks is three times the size of a brick, and hence a day's work of a single ram machine is equivalent to 9,000 bricks.

The molds are interchangeable for any shaped block within the capacity of the machine.

Various sizes are made, some being small enough to work by hand. A machine of the latter kind will, we are informed, turn out 1,200 blocks per day with the labor of a single boy, who also does the mixing and feeding.

The patent for the machine is now owned by the Union Stone Co., 32 Pemberton Square, Boston, Mass., who will fill orders for them. Address as above for further information.

Copper Balloons.

In a recent newspaper article, John Wise, of Pennsylvania, the aeronaut, recalls his suggestions for the use of balloons for the capture of the fortress at Vera Cruz, during the war with Mexico, in 1846. He proposed to elevate balloons above and near the fortress, to a hight of from one to five miles, with cable attached, and then to hurl down explosive shells in such numbers as to render the fortification untenable.

Our military men of that day could not conceive of the practicability of the project. Congress refused an appropriation, and the balloons never rose to view. Mr. Wise thinks it needed a man like Gambetta, the French Minister of War, to boss the job, and render it effective.

In the same article Mr. Wise describes a copper balloon of his own invention:

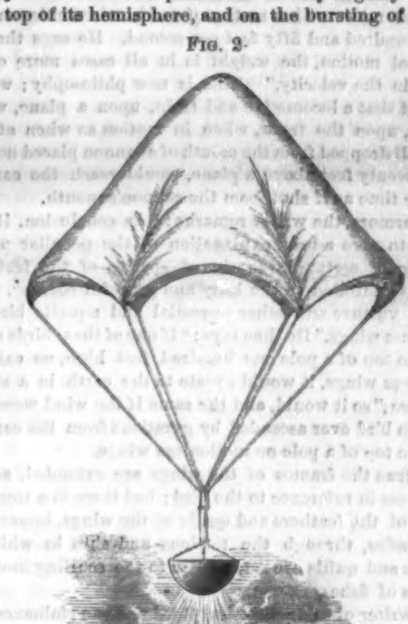
One of two hundred feet in diameter could be constructed of copper weighing one pound to the square foot, which, deducted from its ascensive power when inflated with hydrogen, would leave sixty-eight tuns of lifting power. Such a machine, constructed inside a framework from which to solder it together, could be easily inflated, by the expansion of a cloth balloon inside of it filled with atmospheric air, and then the hydrogen gas introduced between the inside copper surface and the bag of atmosphere, so that, as it filled with gas, the atmosphere and its envelope would be expelled from its lower orifice. To meet the necessity of the expansion and contraction of gas in the copper war ship, it would have to be supplied with an india-rubber diaphragm in its lower most section, which would rise and fall agreeably to the necessity as it occurred.

MORTAR LIGHT.

The "Light Ball" shown in the engraving, fig. 1, consists of two tin hemispheres, the lower one of which is filled with an inflammatory composition, and the upper one with a folded calico parachute, which is attached to the lower one by a small chain and cords, the whole being enclosed in a galvanized iron shell made in two parts; the edge of the lower half overlaps the upper half for a short distance, and the two are soldered together, a small space being left in the upper half, to contain the bursting charge and the socket into which the fuse fits. The action is as follows:—On the mortar being fired, the flash from the charge ignites the fuse (previously bored to its required length), which burns until the fire flashes through the prepared hole into the powder channel and ignites the bursting charge in the ball. The soldered junction then gives way, and the outside hemispheres are blown in different directions. The top one, being attached to the inside hemisphere, containing the calico parachute, by a small chain, jerks it off. The parachute is very slightly attached to the top of its hemisphere, and on the bursting of the ball this slight attachment also gives way; but at the same time this connection assists in the expansion of the parachute by drawing out its top. The composition in the lower inside hemisphere is ignited by a quick match, laid in grooves from the bursting charge to the priming at its bottom. The parachute being now released expands like a large umbrella, as seen in fig. 2, the burning composition assisting to keep it up on the same principle as a fire balloon. This composition gives an extraordinarily brilliant light, illuminating the ground from 300 to 400 yards round the point over which it is suspended. The shell ought to burst just after it has attained the highest point of its flight. The light is useful to discover the enemy's working parties in time of war, or to ascertain what he is about at night. With a few of these light balls fired together, objects can be discovered at a considerable distance on a dark night nearly as well as by daylight. Before using them, note of course must be taken of the wind, as, should it not be blowing towards the enemy, he will in all probability reap the advantage you have endeavored to obtain for yourselves. The great advantage this parachute light has over all other light balls is that, on account of its elevated position, it is impossible for an enemy to extinguish it until it descends.—*Mechanics' Magazine.*

FIG. 1.

FIG. 2.



IRON AS A DEODORIZER.—The porous, spongy cast iron, which sometimes is observed in imperfectly smelted pigs, is stated by Dr. Voelcker to be a most valuable deodoriser, and to surpass charcoal in this character. Sewage can be most efficiently purified by its use. Such iron can be made by pulverizing ore and charcoal together, and smelting in a close furnace.

Correspondence.

The Editors are not responsible for the opinions expressed by their Correspondents.

Flight of Birds.

MESSRS. EDITORS:—A constant reader of your journal is unwilling that the article of March 25, on "The Flight of Birds," should pass unanswered. You say you are not responsible for views entertained by your correspondents; it is well for your reputation, that it is so, in this instance. The writer takes, as an example of swift flight, a five pound wild duck, which he elevates to a point whence "the flight proper commences." He then says: "In this situation, it is evident that the animal must constantly gravitate diagonally towards a point on the earth at a considerable distance ahead;" this is not true. The duck, and every other five pound object on or near the earth, gravitates vertically towards the center of the earth; gravitation does not stop to see which way the duck is "heading," but draws downwards no more in the direction of its head than of its tail. He says: "The swift motion of the animal reduces the weight for the time being;" this is not true. A five pound duck gravitates five pounds on the same plane, whether in motion or at rest. A kite weighing five pounds may be sustained against the wind, but when so held, it weighs five pounds; that is, the pressure downwards upon the air is as great as if it were in the balance. Again: "The stroke of the wing in flight proper is vertical, and must be made at right angles with the line of progression." True, "and hence the bird cannot propel himself by such a movement of the organs of aerial motion. Birds and bats do not propel themselves in flight;" false, for when a bird is making a vertical motion with its wings, the quills and feathers of the wings are in a diagonal position extending backward and upward from the bone frame work of the wings, giving, by the vertical motion of the wings, propulsion forward and upward. Again, he says: "Birds of passage proceed with a uniform motion of one hundred miles an hour;" they often attain this motion, but not always. Again, "Their progression upon the wing is incidental; the weight of their body is the chief means of their flight; their velocity cannot be increased or diminished while they continue on the same plane of elevation;" all of which is false.

I wish to ask the writer: if the motion cannot be decreased upon the plane, by what means is it decreased upon a down grade? Wild geese often alight in Lakes Michigan and Superior, but never with a motion of one hundred miles an hour, or one hundred and fifty feet per second. He says that "in rectilineal motion, the weight is in all cases more or less merged in the velocity." This is new philosophy; we had supposed that a locomotive and train, upon a plane, was as weighty, upon the track, when in motion as when at rest; that a ball dropped from the mouth of a cannon placed horizonly, say twenty feet above a plane, would reach the earth in the same time as if shot from the cannon's mouth.

Furthermore, the writer remarks: "In conclusion, it only remains to give a brief explanation of the peculiar process of motion of certain large winged species of the feathered tribes, as exhibited in the lofty and graceful soaring, of the sociable vulture and other terrestial and aquatic birds, on motionless wings." He then says: "If one of these birds should leave the top of a pole one hundred feet high, on extended motionless wings, it would gyrate to the earth in a still atmosphere;" so it would, and the same if the wind were blowing. No bird ever ascended by gyrations from the earth, or from the top of a pole on motionless wings.

It is true the frames of the wings are extended, and are motionless in reference to the bird; but there is a tremulous motion of the feathers and quills of the wings, imparted by the muscles, through the tendons and skin in which the feathers and quills are set, similar to the sculling motion of the tails of fishes.

The writer of this article has stood upon an eminence, when there was not a breath of air in motion to move an aspen leaf, when an eagle in his upward gyrations soared so near that we could distinctly see the tremulous motions referred to, accompanied by a shrill humming sound, which sound is not heard when the eagle moves its wings vertically in ascending or when descending rapidly. A current of air does not facilitate the ascent of a soaring bird after it has left water or land. After leaving the earth, the conditions of ascent are the same, if the air has a motion of five miles an hour, as when the gyrations of the bird in a still atmosphere have a progressive motion of five miles an hour. To propel a balloon, against the wind blowing at the rate of five miles an hour, so that the balloon will remain over the same spot on the earth, is equivalent to propelling the balloon in a still atmosphere five miles an hour. But to return to the bird on the diagram, as it leaves the earth, why does it make a diagonal ascent at all, unless it has the power of propulsion as well as of elevation? Gravitation certainly does not propel the bird in its ascent. Why does not gravitation horizontally propel a fish suspended in water by its bladder? Our western eagles, gulls, and fishhawks will not be governed by the laws of the new philosophy, until the writer of "The Flight of Birds" can, by taking hold of the straps of his boots, lift himself up into the ethereal regions.

Traverse City, Mich. A. S. WADSWORTH.

Flight of Birds.

MESSRS. EDITORS:—I have been a constant reader of your paper for the past four years, and during that time have gathered much valuable information from its pages. I have read therein many articles containing facts which were entirely new to me, but never before have I met with anything so astonishing, and so entirely at variance with my preconceived ideas concerning the physical laws, as the assertions contained in an article entitled "the Flight of Birds," which appeared in the number issued March 25th.

I have often watched birds in their flight, and wondered how they did it. I knew that I was ignorant on that point, but, since reading the article referred to, the conviction of ignorance on many other points has been forced upon me.

The inference drawn from the assertions of all the writers on physics, whose works I have read, is, that "to hold five pounds weight suspended in the air, a power of five pounds is absolutely necessary;" but Mr. Davidson's duck, exerting a power of one pound, holds a weight of five pounds suspended in the air, and moreover propels it, or makes it get along somehow through the air, at the rate of 100 miles per hour. Marvelous duck! The invention of a perpetual motor would be a trifle to a fowl of thy abilities.

Hold! I forget: "The duck's weight is, for the time being, reduced four fifths," because of the fact that he advances through the air at the rate of 100 miles per hour. How thankful that bird should be that he does not move at the rate of 150 miles per hour, for in that case he would weigh one fifth less than nothing, and consequently would tumble up through eternal space, *ad infinitum*.

There is another astonishing feature of this fowl's performance. He does not propel himself, but, by vertical strokes of the wing, holds himself at the desired elevation, and is *tumbled* through the air, on a horizontal line, by the force of gravity. When I went to school, they taught me that if a body were acted upon by two forces, from opposite directions, it would move in the direction of the greater force; yet this marvelous bird flies straight up, and is attracted straight down, and goes ahead at the rate aforementioned. What careth a duck for the laws of the resolution of forces?

Scarcely less wonderful is the performance of the majestic eagle. Well may he be called the bird of liberty. When he wants to soar heavenward, he flaps his wings a few times (merely to get clear of local obstructions) and then spreads them, and "goes it" like an ant climbing a corkscrew. He meets two forces, the "wind" and "gravity;" the one acts horizontally, the other perpendicularly downwards; yet that ingenious bird makes that horizontal force "boost" him up against the other to an indefinite hight, without the least exertion, beyond a mere turn of the head. How in the world does he do it? If some man of science and common sense would watch him and study his motions, he would, without doubt, give a reasonable analysis of them, which, if published, would be read with interest by many, besides the subscriber, H. H.

La Salle, Ill.

Chemistry of Honey.

MESSRS. EDITORS:—On page 99, present vol. SCIENTIFIC AMERICAN, J. H. M. makes inquiries about the chemical properties of honey. The chemical formula for honey is, carbon, 12, hydrogen, 14, oxygen, 14: for beeswax, C, 24, H, 34, O, 2.

Glucose, or grape sugar, is obtained from honey by treating it with alcohol. This sugar is employed in Europe for ordinary sweetening purposes, for confectionery, etc. But the abundance of cane sugar in this country makes its manufacture unprofitable. It has been proposed, and at present prices of strained honey (market quotation in New York ten cents per pound), I should think it might be profitable, to manufacture honey into confectionery in this country. I believe it is used largely for this purpose in Germany.

As I am ignorant of the processes of manufacturing confectionery, except molasses candy, some of your readers may enlighten me upon this branch of industry.

Chemists have given us the foregoing formula for honey, but, when first gathered, honey partakes more or less of the essential properties of the plant from which it is gathered. This essence soon evaporates, if the honey be obtained from certain plants; while from others—buckwheat, for instance—the odor and taste is retained for a great length of time.

A. M. B., on page 108, truly says that the crystallization of honey is an evidence of its purity; but he must know that many persons are more fastidious than wise about the food they eat. Honey in the comb is generally preferred, because of its beautiful appearance, and the impossibility of its being adulterated. Still, wax is very indigestible, and pure extracted honey is not only cheaper, but far more healthful and convenient to handle.

There is a process for converting honey into wax, but, owing to the large amount of honey required to produce a small quantity of wax, the manufacture is unprofitable. There is much interest in the production and uses of honey, and it will soon find its proper place and price, for use upon the table and in the arts. APIARIAN.

Whitehall, N. Y.

Traction Engines.

MESSRS. EDITORS:—Having recently witnessed the performance of the *G. H. Craft*, a road steamer invented in New Albany, Ind., I think the position taken by you, in your article on rubber tires, is not entirely correct. You say: Loss of power in going over rough roads would not result, could the power, developed in falling, be wholly applied to useful work in the direction of the advance of the machine. The fact is, however, that, in any method of propulsion at present known to engineering science, it cannot be so applied. The construction of the road steamer alluded to is such that when a stone or brick is mounted, it does not fall after passing over the obstruction, but lunges forward and gives back, so to speak, the force expended on its ascent. With this machine there is no concussion on rough roads, and, while mounting an ascent of one in four, a brick was placed for it to run over. Even on this steep grade, the machine did not fall after passing over the brick, but forced itself farther up the incline to correspond with the angle at which the pushing legs were adjusted. I belive this machine has a grand future before it. JOHN G. WILSON.

Louisville, Ky.

What Inventors Have Done.

I know that there are many persons in whose minds an invention is but the subject of a sneer. Such men are unbelievers in the wisdom of encouraging the useful arts by the granting of patents at all, and therefore probably regard extraordinary taxation as not only expedient, but also as eminently just.

I believe such opinions are founded in error. They usually rest, not so much upon the merits and principles involved, as upon those abuses which are sometimes unavoidable. Fraud and imposition certainly sometimes find admittance through this channel; but when any profession or walk in life can be pointed out, against which a like objection does not exist: when law, medicine, science, literature, divinity, and even statesmanship, shall be known to afford no opportunities for the practices of the impostor and the charlatan, it will be time to consider whether it is not unsafe to form an opinion upon any subject from its unavoidable abuses, and to suggest the reflection that the more valuable coins present greater motives to the counterfeiter than do the more worthless, and are therefore the more probable subjects of fraud.

I believe I shall not be charged with extravagance, by any sound and reflecting mind, when I assert, as I now do, in this presence, that the class of men who were intended to be encouraged by our patent system, are the most meritorious and useful that are ever to be found in any age or country. They have been the creators of all the wealth of which the law gives them the limited enjoyment. They have filled the world with the comforts and conveniences of life, which but for them would never have had an existence. They have made aggressive incursions into the realms of ignorance, to discover and utilize the richest treasures, which were hitherto valueless or neglected. They have, with wizard touch, revealed the great secrets of Nature, whereby the human race has, from time to time, been elevated to a higher plane of existence. The telegraph, the railroad, the steam engine, the printing press, the plow, the alphabet, and even spoken language itself, are only leading specimens of the myriads of inventions that have contributed to the extension of human power and human happiness, and have been the chief instruments by which civilized man has been raised above the savage, and even the savage above the brute.

Without inventions of the more modern type, the realms of science would still have remained in a great degree unexplored, and even the voice of religion itself would have been comparatively weak and inexpressive. Through such inventions the wonders of the universe have been revealed to mortal ken with the most extraordinary fullness and perfection. We have been enabled on the one hand to soar intellectually through the regions of illimitable space, and on the other hand, to almost count the ultimate atoms of matter, and to watch the habits of as many separate existences in a cubic inch of stagnant water as there are human beings on the entire surface of the great globe we inhabit. How astonishingly are we thus enabled to enlarge the scope of our understanding of the Great Omnipresence, in all its comprehensiveness, and in all its minuteness of detail!

Are not men of this class, by whom such results have been produced, entitled to at least an equality of the public consideration? Special favor is not sought, but simple justice may certainly be reasonably expected.—*Judge Mason*.

The Twenty-Fourth of May.

Twenty-seven years ago, May 24th, Miss Ellsworth sent that message over the first wires erected on the American continent, which, in its laconic grandeur, gave token of what it signified to the world, and properly and devoutly recognized the source of the latest and best gift of science to mankind. It was the first message which woke the slumbering spirit of the silent wire to a knowledge of its powers and to its new and grander uses. We have occasion to know that although in the moment of its passage, the inventor of the machinery by which the electric current first made an intelligent record to the human eye, with a joy which he would have been less than man not to feel, greeted gladly the first words of the child his brain had born, yet that then as now he claims to have been only the instrument of the Almighty in the delivery of the great gift of the century to his race. So the message may be read to-day in the light of these wondrous intervening years, with a devouter recognition of where gratitude is due; and while the mechanism may bear the name of Morse, the mind of thoughtful men, looking beyond the inventor's mediate work, exclaims with deepening recognition: "What hath God wrought!"

Those who have seen the plaster cast of the statue of Prof. Morse, now in the National Art Foundry in process of casting, know that it represents the Professor presenting this identical message and uttering, as his own, the exclamation it bears It is urged that the date of the receipt of that message is the proper date of the inauguration of the statue. We acknowledge it fully. Additional men, therefore, have been put to work on the molds, so as to have the statue ready before that time. The intelligent head of the foundry will do all he can to secure its completion. On the 1st of May it will be definitely announced whether the ceremonies of inauguration can then be performed. We hope to announce at that date that all is ready, and that on May 24th the statue of Prof. Morse will be unveiled.—*Journal of the Telegraph*.

Iron in Architecture.

The following able remarks upon the use of iron in architecture are extracted from the *American Builder:*

The questions involved in the use of iron relate to its value as a lasting and strong material, and the conditions under which it may be employed without violating the known and universally recognized laws of appropriateness in construction. As regards the superiority of iron over any other material for performing a certain part in architecture, there can exist no doubt. Only the necessities of construction have made its use so general, especially in America. Cast iron is so notably adapted to resist crushing weight, that slim columns perform the work where, of another material, a heavy wall would be required.

Rolled iron possesses the same qualities when used for beams. Hence the demands of trade, where space is required for display, necessitate the use of the material which will support a given weight, and occupy the least room. Especially is this the case with store fronts, where only slim columns furnish a support, and obstruct but little the view obtainable, through broad glass windows, of the goods beyond. This object could not be secured were any material employed for the columns which did not unite strength with lightness. It is evident, then, that iron must always occupy a place in architecture which cannot be held by any other material.

The faults committed by those who use iron in construction generally arise from the fact that they do not fully consider its capabilities and requirements when artistically treated. Iron is strong, and conveys to the mind an idea of strength, but massiveness of appearance should not be the desired end when it is used in building. Here is a common error. From the nature of the metal it must, to insure durability, be protected from contact with the atmosphere; painting becomes necessary.

The character of this painting is an important thing to be considered. The ignorant designer causes the iron to be painted white, in imitation of marble; or brown, to make it resemble sandstone; or gray, to secure the appearance of granite. No greater blunder could be committed. With almost equal propriety might a chimney be painted in imitation of wood.

Iron cannot be made to resemble stone for any great length of time, looking at its surface alone, and even could this be done, a glance at the slender columns supporting immense weight would cause their proportions to appear unsafe and ridiculous.

But iron can be made to appear light and graceful, and, suited as it is for such an effect, it should be the aim of an architect to produce with it the style of building to which it is so well adapted. Consistency in architecture is desirable; more, it is absolutely necessary, and when iron is treated, not as stone or wood, but as metal, there will be no violation of any recognized law.

Iron may be painted, and it may be made beautiful in itself. It may properly exhibit bright colors, and be picked out with gold and silver until its surface sparkles. It is for such showy, graceful effects that the metal should be used; it is a material perfectly adapted for store fronts or buildings of any class where the essentials are lightness, strength, and showiness, rather than grave and ponderous effects.

Facts about the Sun.

The following results have been deduced from a great number of observations made upon the border of the sun's disk, in the region of the spots, by Prof. Respighi:

In the neighborhood of the spots, the chromosphere (*strato rosato*) is rather low, quite regular, and intensely bright.

Upon the exact locality of a spot, or rather over its nucleus, the chromosphere is generally very low, and sometimes totally wanting.

At the nucleus, either there are no eruptions, or they are confined to jets of great subtilty and little duration.

The nuclei of the spots are either totally obscure or possess very feeble luminosity.

Along the borders of the spots, jets are thrown up of extraordinary intensity and violence, and of very definite configuration.

The jets adjoining the spots consist not solely of hydrogen, but also of other substances, as is shown by their respective bright lines in the spectrum.

Now and then the eruptions in the vicinity of the spots assume gigantic proportions, and are probably the cause of the rapid changes of form and position which are observed in the spots themselves.

There are often seen, in the neighborhood of the spots, jets curved backward upon the solar disk, in forms which are sensibly parabolic.

The immense jets and erupted masses near the spots expand and vanish away more rapidly than in any other region.

On the area of the spots, neither the photosphere nor the edge of the sun's disk shows any perceptible irregularity; that is, neither any perceptible prominence nor depression.

From these results, obtained by spectroscopic observations of the border of the sun and of the protuberances, Prof. Respighi is led to conclude that the photosphere is an incandescent liquid mass or stratum, of suitable specific gravity, by the weight of which various gases, and especially hydrogen, are confined and compressed in the interior of the sun, at an elevated temperature, under an enormous tension, and with a density differing but little from that of the superincumbent liquid stratum.

These gaseous masses in the interior of the sun, not yet having been brought to a condition of stable equilibrium, might in some portions be less condensed, and hence from hydrostatic pressure would rise toward the surface with great velocity, until, overcoming by their enormous expansive force the resistance of the liquid stratum, they wou'd burst through it with a velocity greater or less, according to the depth from which they emerged, and the degree of tension in which they originally were, and would thus develop those jets or eruptions which constitute the protuberances.

The masses thus erupted, then, would not be determined in their movement solely by their initial velocity and the action of gravitation, but would generally be subjected to the operation of other forces, which would concur in their elevation, their diffusion, and their ramification into those extraordinary forms which the protuberances present. According to this hypothesis, the hydrogen issuing from the body of the sun would serve as aliment to the chromosphere, repairing thus the rapid losses of the latter by its not improbable combination with the substances of the photosphere; and it does not appear to Prof. Respighi absurd to suppose that this immense stratum of incandescent hydrogen, that is, the chromosphere, may be the principal source of the heat radiated from the sun.

In regard to the spots, spectroscopic observations appear to show that they are neither cavities nor clouds, but are merely superficial modifications; that is, partial obscurations of the photosphere, produced, probably, by scoria or scum floating upon it. On the contrary, regard being had to the well defined forms of the jets neighboring the spots, to their extraordinary subtility, and to their enormous energy, the supposition does not appear to the author irrational, that the nuclei of the spots consist of portions, slightly projecting from the photosphere, of solid masses or islands floating upon the liquid stratum which envelops the body of the sun. The immense chains of jets and protuberances, which rise ordinarily in the region of the spots, might be the cause of those great transformations which are observed in the latter, and determine, by their resistance in the superficial strata, currents in a direction opposite to that of the solar rotation, from which would result the proper motion of the spots themselves.

The translator of the paper in the *American Journal of Science*, from which we have gathered these statements, says the above conclusion is entirely at variance with those of other observers, unless the author designedly omits the consideration of the penumbra, or makes no distinction between it and the umbra. The observations of Prof. Wilson, in the last century, and of many others since, have shown that the nucleus or umbra is very often, if not generally, lower than the penumbra and the surrounding luminous masses. Some years since, Mr. De la Rue made a photograph of a solar spot, and another of the same spot after an interval of a day or two. When these were placed in a stereoscope, the spot appeared funnel-shaped, the central portion being clearly lowest. Also Zöllner and Lockyer have found, in the displacement of the lines in the spectroscope, that there is sometimes decided evidence of a downward motion in the dark portion of a spot.

Tunnels---Railway and Canal---in England.

The London and Northwestern Railway, from Liverpool and Manchester to Huddersfield and the North, passes through a range of hills separating Marsden, on the Yorkshire side, and Diggle on the Lancashire side, the range bearing the name of Stand Edge, and it has now three tunnels running through it—one a canal tunnel, and the other two for the purposes of the railway.

The first named was commenced in 1794, and completed in 1811; length, 5,451 yards, or 3 miles and 171 yards: cost, £123,803; and the loss of life during its progress was serious.

The first of the two railway tunnels was made by Mr. T. Nicholson, contractor for the Woodhead tunnel, which is shorter than the Stand Edge one by about 40 yards, Stand Edge being 3 miles and 60 yards long. It was commenced in 1845, and completed in November, 1848; the cost was £171,003, 12s. 3½d., of the approaches, £30,605, making a total of £201,608, and the largest number of men employed on the undertaking was 1,953. Nine fatal accidents occurred in its construction.

Messrs. Thomas Nelson & Sons, of Carlisle, were the contractors for the new tunnel; the work was commenced in the middle of April, 1868, and was completed in the middle of October, 1870, or six months earlier than the time specified. Its exact length is 5,435 yards, 1 yard less than its twin tunnel: but the actual length constructed by the Messrs. Nelson is 5,297⅔ yards, the difference arising from a short piece at each end having been made when the first railway tunnel was executed. The whole length is lined with red bricks, faced with blue Staffordshire bricks. The hight of the tunnel inside the brickwork is 20 feet, and the width, 15 feet. The total quantity of brickwork built is 52,156 cubic yards, the total number of bricks used being 16,831,149, the weight of which amounts to 68,000 tuns; 6,271 tuns of coal, 472 tuns of coke, and 2,421 tuns of lime, 140 tuns of cement were consumed; and of powder, 1,744 casks, equal to 174,400 pounds; fusee, 35,853 coils, each 25 feet, equal to 170 miles; candles, 8,745 dozen pounds, equal to 104,940 pounds; oil, 6,416 gallons; and vast quantities of timber were used. The rubbish was conveyed away by means of tramways, which ran through passages under the railway, and was tipped into the boats on the canal before mentioned. It was conveyed through "break-ups" or cross headings, of which Messrs. Nelson constructed 21; but only 16 were used at one time.

For the conveyance of the material used in the construction of the tunnels, 25 boats and 4 steamboats were constantly plying, and an immense expense had to be incurred in erecting huts, providing business offices, and putting down costly plant for economising labor. Only one life has been lost during the construction, but there have, of course, been plenty of accidents of a less serious nature. The work has been pronounced satisfactory in all respects, and the line is reported as being one of the smoothest portions of railway traveling in Great Britain. The line was opened about the middle of February for regular traffic.

Coating Iron and Steel with Molten Iron.

Rufus B. Fowler and Daniel F. Brandon, of Chicago, Ill., have recently patented the following process:

The iron to be applied is melted in a crucible or other suitable receptacle, and thoroughly mixed with borax or other material used for making a flux.

The plate or other article of wrought iron or steel should be covered, upon the surface to be coated, with a very thin layer of finely pulverized borax which has previously been burned, and then placed in a close furnace or oven, and heated to a white or welding heat. It is then placed upon a large anvil or block of iron, the upper surface of which is perfectly level. The article to be covered with the molten iron should then be surrounded by an iron frame or form, in such a manner that the molten iron may be prevented from flowing off the surface to be coated.

The molten iron which has been mixed with borax, as hereinbefore described, is then poured upon the surface of the heated plate or other article of wrought iron or steel. When a sufficient quantity of molten iron has been poured on as described, a plate of steel or hard smooth iron, of sufficient size to nearly cover the whole of the molten iron, is brought down upon its upper surface, and a pressure immediately applied sufficient to reduce the molten iron to the desired thickness, and also to expel all the air or gases that may be contained in the molten iron, and which would otherwise render the coating porous and of no practical value.

The amount of pressure required will depend upon the degree of heat to which the molten iron is brought, and the quickness with which the operation is performed. The pressure should be applied, however, while the iron coating is in a molten state, and it may be applied by means of a lever, a hydraulic press, or any of the known mechanisms or devices by which a powerful pressure may be instantly applied; or, in lieu of the smooth plate or die mentioned above, a roller with a smooth surface may be made to pass over the upper surface of the molten iron, with a pressure sufficient to produce the desired results.

The mechanism used for pressing should be near the oven or furnace in which the plate or other article of wrought iron or steel is heated, in order that the heat of the plate or other article may not fall much, if any, below the welding point when the molten iron is applied; and the surface of the plate or other article of wrought iron or steel to be coated, should be free from dirt, scale, or such other substance as would ordinarily prevent two pieces of wrought iron from forming a perfect weld or union.

The above described process of applying the molten iron to the surfaces of plates or other articles of wrought iron or steel, expels the air or gas from between the molten iron and the surface of the wrought iron or steel, causing a more perfect union between the two, and renders the coating of molten iron much more compact and gives it a smoother surface.

We do not claim any mechanism or device used for applying the pressure; nor do we claim the employment of molten iron for the purpose of coating articles of wrought iron or steel.

We claim as our invention: The process of coating the surfaces of plates or other articles of wrought iron by the use or application of pressure, substantially as described.

Success in Life.

The great secret of success in life consists in bending all your efforts to whatever you happen to engage in. Don't let your fickleness lead you to slight your present occupation, and to think lightly of it, hoping something better will turn up by and by. The way to get along in the world is to make every step one that is ahead, and each to follow its predecessor. For full fifty per cent of the effort of the world is absolutely wasted in indirect, diffuse, indefinite labors. Young men start out in life without purpose or point, casting a thought neither on their fitness nor unfitness for a particular calling; now doing this thing, then that; and after that nothing; one day going on, another on the right (which is wrong) or left, the next backward, and then not going on at all, which is perhaps as bad as the whole combined. The right line in life is the one which leads straight ahead. This almost always secures success. If you are creeping, do it energetically until you can get on your feet to walk; but never do both at once. And when once on your feet, never get on your hands and knees again; but strain all your efforts to your new life.

House Plants.

To succeed in growing plants in dwellings, it is necessary to keep the air around the plants at a moderate temperature, say from fifty to sixty degrees, and as moist as possible, by having the plants stand on damp moss, sand, or other material that will all the time be giving off moisture amongst the leaves.

Any plant having leaves large enough—as the beautiful waxy camelia, the India rubber plant, century, and others, are greatly benefited by occasionally sponging the leaves with water, by which means the dust that accumulates on them is removed—a fruitful source of trouble to house plants. Where sponging is not applicable, as with small leaved sorts, or those of a wooly or rough surface, a syringing, or, what is better, an hour or two in a warm rain, will have the same effect, and be vastly beneficial to the health of the plants.

Improved Dumping Cart.

We herewith present to the consideration of our readers a simple yet important improvement in dumping carts, which will, we think, commend itself to all extensively using such carts on railway works or canals, in brickyards, excavating for building, mines, coal yards, etc.

The object of the device is to so facilitate the dumping of such carts that even boys may perform the driving and dumping, and do the latter almost instantly.

The tail-board, instead of being slid in between cleats fastened to the side of the cart body, or hinged to the same, is fixed to two supporting arms, extending backward from the shafts, to which latter the arms are attached at a point a little in front of the axletree, which causes the tail-board to move backwards, when it lifts, so that there is no strain upon it whatever.

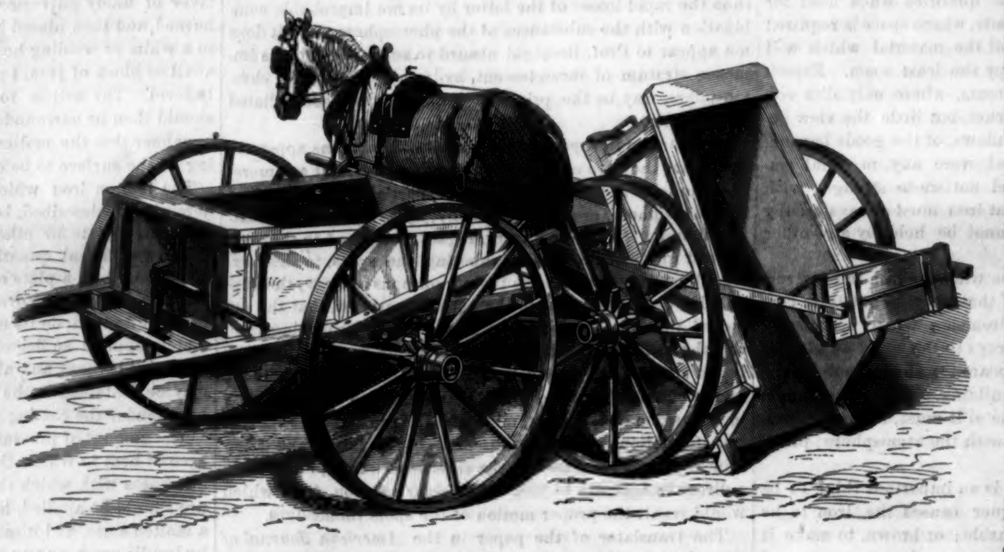
The shafts, instead of being attached directly to the axletree, are pivoted strongly to the side of the body, and a little in front of the axletree, and the cart body is fastened firmly to the axletree, so that the latter forms the pivot upon which the body turns in dumping.

A lever and catch is attached to the front of the body, so that when, after dumping, the latter assumes the position shown at the left of the engraving, it is firmly held in position until the catch is unlocked by the hand lever projecting sidewise from the front of the body, and convenient to the hand of the driver, whether standing on the ground or upon a foot board fastened to the under side of the shafts just in front of the body of the cart. It is impossible for the body to play from side to side (as is the case with other carts) on account of the shafts being attached to the outside of the body, near to the wheels, which gives the horse great control over the cart.

The cart is shown dumped at the right of the engraving. It will be seen that starting up the horse will at once bring the body into the position shown at the left of the figure, and lock it there.

This arrangement obviates all the difficulty of removing or raising the tail-board when the cart is loaded, caused by pressure of the contents. A very slight exertion releases the catch in front of the cart, which instantly dumps, and the moment the horse is started, again closes.

Patented, through the Scientific American Patent Agency, April 4, 1871. For further particulars address William and Henry Hand, Plainfield, N. J.



HAND'S IMPROVED DUMPING CART.

Fossil Forest in California.

Prof. O. C. Marsh, of Yale College, communicates to the *American Journal of Science* an article on the above subject, from which we condense the following facts:

During the visit of the Yale College scientific party to the Pacific Coast, in October last, several members of the expedition, including the writer, while on their way from San Francisco to the "Geysers," took occasion to examine a locality, a few miles from the route, where a number of fossil trunks of trees had recently been discovered.

The locality is situated on a high rocky ridge, in Napa county, California, about five miles southwest of Calistoga Hot Springs, and perhaps ten miles south of the summit of Mount St. Helena. The existence in this place of several petrified trunks of trees was first made public by Charles H. Denison, Esq., of San Francisco, who visited the spot in July last, and soon after gave a short account of the discovery in the San Francisco *Bulletin*.

A careful examination of the locality where the first prostrate trunks had been discovered, soon made it evident that those now on the surface had all been weathered out of the volcanic tufa and sandstones, which form the summit of this part of the mountain ridge. Several large silicified trees were, indeed, subsequently found in the vicinity, projecting from the side of a steep bluff, which had partially escaped denudation. Portions of nearly one hundred distinct trees, scattered over a tract three or four miles in extent, were found by our party; and the information we received from hunters and others, familiar with the surrounding country, renders it more than probable that the same beds, containing similar masses of silicified wood, extend over a much greater area.

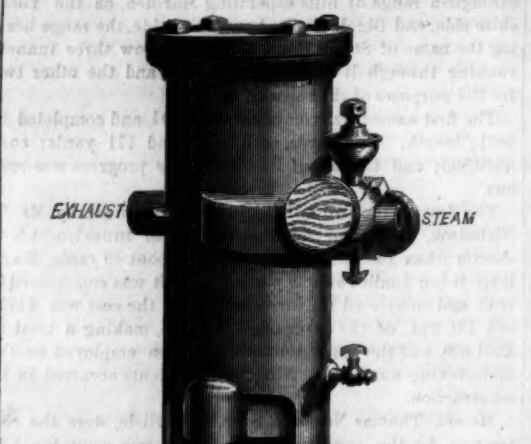
The fossil trees washing out of this volcanic tufa were mostly of great size, and appeared to be closely related to some of the modern forest trees of the Pacific coast, especially the gigantic Conifers. One of the prostrate trunks examined during our explorations was only partially exposed above the surface, dipping with the strata about 10° to the northward. Its accessible portion, evidently but a small part of the original tree, measured sixty-three feet in length, and, although denuded of its bark and very much weathered, was over seven feet in diameter near its smaller end. On a high summit, about a quarter of a mile west of this point, two other large trunks were found, one about five feet in diameter, lying east and west, with thirty feet of its length above the surface. The other rested directly on this, dipping with the strata to the north. The exposed fragments of this trunk indicated that the tree when standing could not have been less than twelve feet in diameter. These two trees had apparently fallen not far from where they were imbedded, as the bark was well preserved, both on the main trunks and on the small branches, numerous fragments of which were lying near. Many other trees were found, nearly or quite equal to these in size; and all those examined indicated a very large general growth for the original forest.

All the trees discovered were prostrate, and most of them, after their petrifaction, had been broken transversely into several sections, apparently by the disturbance of the enclosing strata. A majority of the trunks had a general north and south direction, probably due to the course of the current that covered them with volcanic material, or perhaps indicating, in some cases, the position in which they had fallen. Several of the trunks had portions of their roots still attached, and some were evidently much decayed internally, and worm eaten before their entombment. All the fossil wood observed was silicified, probably by means of hot alkaline waters containing silica in solution, a natural result of volcanic action, especially when occurring in connection with water, as was evidently the case in the present instance.

The trees, closely examined, appear to be all conifers, and in their external characters, especially in the bark, mode of branching, and general habit of growth, most nearly resemble the modern redwoods, still flourishing in the same region.

COPE & MAXWELL'S UPRIGHT BOILER FEEDER.

It is entirely unnecessary to dwell upon the fact, now universally admitted, that it is the best practice to feed boilers uniformly and automatically, by apparatus working independently, whenever it is possible so to do. When boilers are employed to furnish steam for other purposes than motive power, it becomes absolutely necessary to use an independent boiler feeder. The demand for this class of apparatus is already very large, yet it is still increasing. Numerous claimants for public favor are in the market. Many of them are excellent, others not so good; yet most find ready sale. Patents for new devices of this class are multiplying, and still the field seems unexhausted. We this week illustrate a very substantial and compact steam pump, designed for feeding boilers, having but two moving parts in the engine, and but two valves in the pump.



It is a single acting plunger pump, operated by a steam engine, the cylinder of which is cast in connection with the pump chamber, the two being in one piece and forming the body of the machine. The upper portion of the body, or that part above the open space, contains the steam cylinder, and the portion below the space contains the pump or water cylinder. The vertical shaft seen in the open space is the pump ram, which is cast in connection with the steam piston, the two forming but one piece. The valve chamber, containing the pump valves, and having the receiving and discharging water openings, is bolted to the body of the machine at the bottom of the water cylinder, with which it has direct open communication.

The chamber, bolted to the upper part of the body of the machine, or near the middle of the steam cylinder, contains the oil cup through which the cylinder is oiled, and the two regulating valves, which are operated by the round wooden knobs or handles. The steam is admitted to each end of the steam cylinder through two regulating valves, the lower handle operating the valve that admits the steam for the down stroke, and the upper one for the up stroke.

The down stroke, having the most work to perform, requires a larger volume of steam, which is obtained by opening the lower valve the most.

The steam piston is about twice the diameter of the pump ram, which is cast in connection with it; and is hollow, having a cylindrical chamber inside, which is bored out true, and has a small piston accurately fitted to it. This cylindrical chamber forms the steam chest of the steam engine, and the small piston working in it operates as the slide or steam valve, opening and closing the ports so as to admit the steam supplied through the two regulating valves, alternately to the two ends of the steam cylinder.

Though of recent invention, we are informed the pump has been largely introduced in this country, and has given much satisfaction. It has been patented both in this country and abroad, and a large manufactory has been established in London for its construction.

Messrs. Cope & Co., of 118, 120, and 122 East Second street, Cincinnati, Ohio, are the sole manufacturers in the United States, and they may be addressed for illustrated descriptive catalogues, or for further information.

The Walter Printing Press.

At the printing end, it looks like a collection of small cylinders, or rollers. The paper, mounted on a huge reel as it comes from the paper mill, goes in at one end in an endless web, 3,300 yards in length, seems to fly through among the cylinders, and issues forth at the other in two descending torrents of sheets, accurately cut into lengths, and printed on both sides. The rapidity with which it works may be inferred from the fact that the printing cylinders (round which the stereotyped plates are fixed), while making their impressions on the paper, travel at the surprising speed of two hundred revolutions a minute. As the sheet passes inwards, it is first damped on one side, by being carried rapidly over a cylinder which revolves in a trough of cold water; it then passes on to the first pair of printing and impression cylinders, where it is printed on one side; it is next reversed and sent through the second pair, where it is printed on the other side; then it passes on to the cutting cylinders, which divide the web of now printed paper into the proper lengths. The sheets are rapidly conducted by tapes into a swing frame, which, as it vibrates, delivers them alternately on either side, in two apparently continuous streams of sheets, which are rapidly thrown forward from the frame by a rocker, and deposited on tables, at which the lads sit to receive them.

The machine is almost entirely self-acting, from the pumping up of the ink, into the ink box, out of the cistern below stairs, to the registering of the numbers, as they are printed, in the manager's room above. Newspapers of moderate circulation, and jobbing work generally, are now worked on machines the design of which was originally that of Kœnig, as improved by Applegath and Cowper, about the year 1818. Innumerable improvements have been made subsequently, and the manufacture of printing machines has become a large and important business.—*Printers' Circular.*

Salt in San Domingo.—A recent letter reports that a mountain of salt, of a purity unequalled by any other natural source of supply, has been discovered in the island of San Domingo. The writer states that the hill is nine miles long, and one and a quarter miles wide, and that shafts have been sunk to a depth of 800 feet through the salt, without reaching the underlying strata. It should be stated that the salt is only one side of the hill, the crown or ridge dividing it from a series of limestone and sandstone layers. The ridge is of alabaster, of great purity and whiteness. The salt is stated to contain 98 per cent of pure saline matter, and is of crystal clearness.

Scientific American.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

NO. 37 PARK ROW (PARK BUILDING), NEW YORK.

O. D. MUNN. A. E. BEACH.

"The American News Co.," Agents, 121 Nassau street, New York.

"The New York News Co.," 8 Spruce street, New York.

Messrs. Sampson Low, Son & Marston, Crown Building, 185 Fleet street, Trubner & Co., 60 Paternoster Row, and Gordon & Gotch, 121 Holborn Hill, London, are the Agents to receive European subscriptions. Orders sent to them will be promptly attended to.

A. Asher & Co., 20 Unter den Linden, Berlin, Prussia, are Agents for the German States.

VOL. XXIV., NO. 18 . . . [NEW SERIES.] *Twenty-sixth Year*

NEW YORK, SATURDAY, APRIL 29, 1871.

Contents:

(Illustrated articles are marked with an asterisk.)

PROPOSED CHANGES IN THE BRITISH PATENT LAWS.

A bill has lately been presented in Parliament, which, if passed, will add some novel features to the British patent laws.

The new bill provides that the Lord Chancellor and the Master of Rolls, who at present do nothing except draw large salaries, are to be relieved, and their places in the Patent Office filled by three persons called "Special Commissioners of Patents," one of whom is to be a lawyer, the others, persons of distinguished or well ascertained ability and experience in chemical and mechanical knowledge.

All proceedings for patents are to be conducted at such places and in such manner as the Commissioners shall direct, and they shall have power to make rules and regulations, summon witnesses to give evidence in any case, and also to require models to be deposited. In fact, the grant of applications for patents is to be more or less discretionary with the Commissioners.

The official fees to obtain a patent are fixed at about $62, with an annual payment of $25. This is a great reduction over the present rates.

After a patent has been issued three years, during which it has been exclusively and publicly enjoyed by the patentee or his assign, or at any time after the validity of the patent shall have been established in a court of law, such patentee or assign may apply to have the patent registered as an "indefeasible patent."

If no objection to such registration be made, or, if made, be disallowed, the Commissioners shall cause such patent to be registered as an *indefeasible patent*, and thenceforth the validity of such patent shall not be questioned in any court or in any manner whatsoever.

At any time after the expiration of a term, say of the first five years after the issue of a patent, the Commissioners may direct the holder of the patent to grant licences to any person who shall apply for the same, upon such terms and conditions as the Commissioners shall designate; and if the patentee refuses to obey the order of the Commissioners, the patent shall become null and void.

The provisions relative to the registration of indefeasible patents, and the compulsory issue of licenses, are novel, and we should be glad to see them put to a practical test. So long as patents are granted, it would seem to be only right and proper to establish, by law, some period during which he patentee may enjoy the fruits of his discovery, unvexed by the cares and expenses of law suits. At present there is no such limit, and in this country, as well as in England, the patentee is always liable to attacks upon his patent, by anybody who takes a fancy in that direction.

The provision giving the Commissioners power to order the patentee to issue licenses, seems to have for its object to discourage the formation of great patent monopolies, and also to secure to the public the right to use inventions upon fair and reasonable terms. These are good and plausible objects; but if the terms and conditions of use are left wholly to the discretion of the Commissioners, the provision would probably be of little value. Few officials are sufficiently virtuous to stand up against the pecuniary temptations which great monopolists command.

In this connection, it is proper to refer to a very interesting discussion upon the Patent Laws, at a recent meeting of the Society of Arts, in London. The subject was opened by the reading of a very able and comprehensive paper by Mr. A. V. Newton, who is one of the most experienced and prominent patent solicitors in Great Britain. He went over the whole ground upon which patents rest, pointed out the defects of the English, the American, and other systems, and suggested such reforms as appeared to him most needed. He showed conclusively that most of the defects attributed to the present British laws were really due to the ignorance and narrowmindedness of the Lords who administer them. Mr. Newton suggested, as a remedy for useless litigations, that before any action should be brought into court, the several contestants should be compelled to appear before an open tribunal, ruled by a competent examiner, and submit their several allegations; the examiner to investigate their merits and determine what points, if any, should be placed before the court for adjudication. Such examination, he contended, would do away with the greater proportion of the present needless and expensive law suits. Mr. Newton also favored the compulsory grant of licenses to use patents.

In the course of the discussion which followed, while the views and suggestions of Mr. Newton were, in the main, approved, it was held by most of the speakers that the English laws ought also to be modified so as to provide for a primary examination of all applications for patents, analogous to that in vogue at the American Patent Office.

The principal objection raised against this examination was the great number of clerks and other officers required, many of whom would be necessarily incompetent; it having been shown that sixty-two examiners and three hundred employees were engaged at Washington, chiefly for the above purpose. One of the members suggested that no such force would be required in England, as the total issue of patents is only 2,400 per annum, or eight per diem.

He might have added that there is not much probability of any rapid increase in the issues of British patents, while the present high fees are continued. In this country the official fees for a patent are only $35; while the number of applications filed and examined, in 1870, was 19.171.

CANAL NAVIGATION.

The bill introduced in the New York Legislature, offering a prize of $50,000 for a practical means of propelling canal boats, to be driven by steam, hot air, or electricity, has, at least, opened the eyes of inventors to the fact that the time is ripe for the introduction of a successful system, which shall be able to supersede horse towing.

We are not inclined to ridicule in the least the attempts that have been made, and are now making, to supersede steam, as a motive power, by hot air, or electro-magnetism. It is only when inventors in this field seek to delude the public by claiming results they have not attained, that they may properly be made to feel the lash of satire. Yet, in the present state of affairs relative to hot air engines and electro-motors, it was almost superfluous to include them in the offer. Neither of them can at present be practically used for towing or propelling boats, and there is small prospect that either will soon be available for any such purposes.

It seems to us that the question of motive power is a side issue, of little account as affecting the main problem. How to propel canal boats without towing by horses, in such a way as not to destroy the banks of the canal, so that boats may run in either direction without obstruction, pass into and out of locks with the same facility as at present, and make as good or better speed than is made under the present system, with economy of whatever motive power is employed, seems to be a fair statement of the problem.

The system of laying wire cables in the bottoms of canals and rivers, and winding them off and on revolving drums, has been extensively employed in Germany, Holland, and we believe to some extent in Belgium, with considerable success. There would be, however, many difficulties in applying such a system on American canals. Our ideal of a propeller for this purpose is one that makes each boat independent of every other boat, and which answers all the conditions above enumerated. Next to this ranks a propeller capable of towing a number of boats simultaneously.

Traction engines, running on tow-paths, if they can be made so as to mount and cross bridges, might at once be made to answer the last named purpose, provided that they would not injure the banks or bridges by their weight; and even if the latter were the case, of course bridges and banks can be made to be strong enough. So many kinds of propellers to be directly attached to boats have been invented, that we cannot attempt a minute review of them here. There have been side wheels, stern wheels, stern screws, and bow screws, and even paddle wheels placed at the bow. There have been endless chains, designed to propel boats by friction against the bottoms of canals. There have been machines for "poling" boats along, as is now done by hand on occasion. Endless ropes, to which boats could be hooked, the ropes to be kept in motion by water wheels, have also been proposed. Boats have been propelled by jets of water, or air, forced out of the stern, and by air propeller screws, driven at high speed. Wheels rolling upon the bottoms of canals have also been tried.

Of all these methods, three only have, we think, promise of success, namely: the traction engine, the bow paddle wheel, and the bow screw propeller.

If the use of rubber tires, such as are used on the Thompson road steamer, proves to be what its promoters claim for it, and what those interested in other traction engines dispute, engines provided with such tires can undoubtedly be used for towing boats, with great success. They can cross bridges, and will not injure tow-paths as much as the feet of the horses now employed. The expense of towing by such engines would be far less than towing by horses. A year or two will settle the question of the economy and durability of rubber tires; and if they perform all that is desired of them, their use on traction engines for canal towing may become one of their most important applications.

Of the two other methods thought practical, we are inclined to favor that of the screw propeller in the bow, rather than the paddle wheel, though both accomplish the same results. The water is in both cases forced directly backward under the bottom of the boat, and quietly delivered in the rear, without side swells, which injure the banks. But the paddle wheel is more cumbrous than the screw, and has to be made adjustable vertically, to accommodate itself to the varying draft of boats, while the screw needs no such adjustment, and occupies very little space comparatively. The latter system, known as "Main's system," has, as our readers are aware, been tried with satisfactory results on the Erie canal in New York. Of all methods yet employed, it seems most likely to become popular, and to supply the long sought-for means of propulsion.

From this brief review of the subject, our inventors may learn something of what has been done, and judge of the possibility of striking out original paths for themselves. It is not probable that all mechanical resources have been exhausted, and it would not surprise us to see something yet devised, quite in advance of any method yet proposed.

ROOFS AND ROOFING.

It would be difficult to point out a more important subject, or one more beset with practical difficulties, than the one chosen for the title of the present article. So far as cities are concerned, the old fashioned shingle roofs are things of the past. There have been as many inventions for roofs and roofing as for street pavements, yet there is a want of cheap, permanent, and tight roofs, and there is no betterfield than this for inventors to exert their skill in. In this assertion we do not mean to cast any odium upon many valuable inventions that have done and are still doing good service, in bridging the gap between the roof that was and the roof that we trust is yet to be. We do not see how the world would have got along, or could now get along without them. That they possess imperfections does not affect their sale and employment, so long as they are the most perfect of anything yet available. Inventors may rest assured, however, that the problem of roofs combining maximum durability and tightness, with minimum cost, is not yet solved. We need not dwell upon the fact that he who shall succeed in solving it satisfactorily, will be likely to reap a large reward for his invention. The field is so enormous, and the demand so great, that the roof which answers to all the conditions required would be one of the most valuable inventions of the age.

We have been led to these remarks by a conversation with Elder Evans, of the Shaker Settlement at New Lebanon, in which he has given us the experience of that community in the matter of roofing. The buildings of the society are extensive and numerous, and present a very large roof area. It has given these people very much trouble to select and apply roofing materials, such as would give a fireproof, tight, and durable covering to their buildings. They have tried nearly everything in market, with that thoroughness characteristic of all their work, and have finally settled upon slate with a felt lining as the only material that combines all the qualities essential to a good fireproof and durable roof. Their method of laying this sort of roof is, first, to cover the rafters with edged boards, putting the latter close together. They then felt, taking care to lap and cement well, as upon this depends the ultimate tightness of the roof, against drifting snows in high winds. The slates are then put on the roof in the best manner possible, which can be done as slowly as may be necessary, the felt making a tight roof, which only needs protection, from external influences, by the slate.

It is the opinion of Mr. Evans that gravel roofs may be made so as to do good service, but that they are not *likely to be so laid*. The variations in temperature, damp weather, etc., which ought to interfere with the laying of such roofs, are not often allowed to interrupt the progress of a job in hand, and imperfect work is the result. The society alluded to has such a roof, laid in the most thorough manner possible, that has been in use since 1859, and has as yet given no trouble.

Their experience with tin roofs has been decidedly unfavorable. Plastic slate has also failed utterly, though they have done their best to make it a success, trying it in numerous ways.

It seems that the contraction and expansion of continuous metal roofs will generally cause leaks to succeed each other,

so as to require a constant succession of repairs; and the larger the roof, the greater is the annoyance from this cause. Such roofs, to be good, ought to be made of small pieces, which, while they act together in shedding rain and keeping out wind, act individually when expanded by heat or contracted by cold.

The use of slates or shingles for roofing necessitates greater pitch to roofs than is given to those of ordinary city buildings; and when slates are employed, their weight requires increased strength in the supporting parts. These are drawbacks which are seriously felt in cities, where room is so valuable as to make flat roofs very desirable.

Such, in brief, is the present condition of the roofing question in this country. How long it will remain so depends wholly upon the fertility of inventive genius.

MINING SCHOOLS IN THE UNITED STATES.

A paper bearing the above title, written by John A. Church, E.M., and originally published in the *North American Review*, was deemed of such value by the trustees of Columbia College that they requested permission to republish it, in order to secure for it a wider circulation. Permission was accorded, and the paper, reprinted in pamphlet form, is now before us.

We are not surprised at the desire of the trustees of Columbia College to circulate this paper more widely, as it is perhaps as thorough an exposition of the state of mining schools, and the needs of the country in this respect, as has ever been written.

We shall only attempt, in the present article, a very brief review of this interesting and valuable paper; and though we must, for want of space, give a very inadequate idea of its contents, we shall be able, at least, to do an act of justice to the first established, as well as the most complete, mining school in the United States, namely, that of Columbia College.

The author, upon the authority of Commissioner Ross Browne, states that experienced investers, in Western mining property, are unwilling to pay for a mine more than two and one half times its yearly profit. Such property is not considered a safe investment unless its annual profit, on cost of purchase, is forty per cent. The reason ascribed for this state of things is, that the mines are so unskillfully and unscientifically managed, that if, to use the precise words of Mr. Church, "an investigation could be had of the exact proportion of precious metal saved to the quantity in the ore, the story would be astonishing even to scientific men. Without careful proof, it is impossible to make men believe the reports of the few competent observers who have been there, so apparently incredible are the results of recklessness and want of knowledge. It was difficult to introduce even the thinnest entering wedge of common sense into this hard prejudice against skill and study. For a long time the miners refused all help from schools or scholars; but the experience of continual trouble with their ores, and the gradually developed fact that they often lost more than they gained, have worked a complete revolution."

The more difficult ores are found in Nevada, Montana, and Colorado. But Mr. Church states that the early losses, in even the more easily worked ores of California, have been estimated as being at least two thirds of the gold really attainable, and no one has estimated them as less than one half.

In Europe, mining schools have been long established, and indeed form part of the system of government. The knowledge acquired in these schools enables ores of low grade to be worked in European mines, many of which would otherwise have to be abandoned.

Three grades of schools, for this purpose, are maintained. The right to attend the lectures, even in the primary schools (*Bergschüle*), is not easily attained. Mr. Church tells us that, "Entering a metallurgical work, a young man first spends two or three years in wheeling slag to the waste heap; then as much more time at each of the following steps: wheeling ore to the mixing bed, shoveling ore into the weighing bucket, weighing ore, working at the roasting heaps, throwing ore into the furnace. Here his progress is slower, and he may remain at the last employment five or ten years. Finally he becomes smelter or tapper of the furnace. The uneducated man can rise no higher. The educated man spends much less time at each of these grades, but go through them he must. He is usually occupied two or three years in all at practical work, and then performs clerical duties in the office. Rising higher and higher, he may in time become director of a smelting establishment or a mining district. The director of the world famous mines around Clausthal, Andreasberg, and Altenau, in the upper Harz Mountains, is an instance of a man who has passed through the commonest grades of service to a high position; he was a picker of ore in his boyhood. Plattner, a thorough chemist, founder of the analysis with the blowpipe, and an elegant as well as scientific writer on metallurgical chemistry, began in the same way."

The higher grades of schools (*Bergakademien*) are scattered throughout Europe; the four considered to be of first rank being at Paris, Freiberg in Saxony, Berlin, and St. Petersburg. The French school is distinguished for its breadth of instruction, the Freiberg school for its facilities for practice in mines and smelting works.

We are sorry to say that there is undoubtedly too much truth in what Mr. Church affirms of the mining schools in the United States.

"At present there is but one fairly established school of this class in the country—that in New York. Institutions which bear the name of schools of mines are also to be found in New Haven, Boston, Troy, Philadelphia, Ann Arbor, and many other places. But those where the instruction is general and complete, as at Cambridge or New Haven, lack the students necessary to form a living school, while the others have no claim to the title they have taken, except by virtue of a course of lectures on metallurgy or mining, tacked on to their regular studies. The latter are no more schools of mines than is the Military Academy at West Point, where a course on metallurgy has been given for years. They lack not only the purpose, the singleness of aim, the undivided attention to one absorbing subject, without which a school of this kind has no life, but also the support necessary to carry on so expensive an institution."

The New York school was founded in 1864. The number of students on its opening day was twenty, and before the year closed there were fifty. It has since had an average of fifty new pupil each year. Mr. Church characterizes it as one of the best schools of its kind in the world. "More scientific than Freiberg, more practical than Paris," are the terms of high praise he accords to it, and he adds; "Remarkable as it may seem, no school in Europe, unless that in St. Petersburg be excepted, can compare with it in the appointments, either of its chemical or its assay laboratories."

We will close this review by quoting a foot note appended to the last page of the pamphlet, which contains statistical information of importance.

"The cost of this school (New York School of Mines) for the last five years of its existence has been $248,049, and its receipts from students, $82,134. The first year, which was exceptional, cost only about $28,000, but the average payments are very nearly $50,000, and the average receipts, $16,000. These figures may be studied with advantage by those who would be glad to see the country filled with schools of this kind."

USES OF INFUSORIAL SILICA.

Infusorial silica is now employed as a substitute for heavy spar, in the manufacture of certain kinds of rubber goods. As india-rubber will float on water, it is desirable to have something to add to it that is lighter than heavy spar, and the silica seems admirably adapted to take the place of the heavy earth. By mixing three to six parts of infusorial silica to one part of freshly burnt lime, and stamping the whole, after slightly moistening it, into a suitable mold, artificial stone of any desired form can be made. Such stones become extremely hard, are impervious to water, are finer grained than cements or *béton*, can be used for gas or water pipes, and will take any color. As there are large deposits of diatomaceous earth in various parts of our country, this application for artificial stone and cement is well worthy of consideration.

By combining infusorial earth with native magnesite and chloride of magnesium, a cement is produced which is known in Germany under the name of albolith cement. The chloride of magnesium, obtained as an incidental product in salt manufacture, is very cheap in some parts of Germany, and the occurrence of large deposits of magnesite renders this variety of cement available in Europe for many purposes. A fine glaze for earthenware is obtained by fusing infusorial earth with crude borate of lime, or boronatrocalcite. A variety of porcelain can be made by fusing infusorial silica with the borate of magnesia of the Stassfurt mines. This kind of porcelain can be cast, pressed, and, if sufficiently thin, can be blown as easily as glass. It is capable of extensive use in the arts.

Infusorial silica is the best material for absorbing nitroglycerin, in the manufacture of dynamite, and is used for that purpose. Ordinary sand is not sufficiently porous. The ready solubility of this form of silica in soda, suggests its application in the manufacture of liquid quartz. It is not a little singular that an earth which has long afforded test objects for microscopists, and has been employed as a polishing powder, should become an article of so much importance in the arts.

CARBOLIC ACID.

So much is said about carbolic acid, and it is now so largely used in medicine and the arts, that more information ought to be popularly disseminated in reference to it. It is not a new thing, but most of its applications are of recent date; and as nearly every person who has taken out a patent has given it a new name, we are often perplexed to recognize the precise article that is meant. It may be well to look into this labyrinth of names before proceeding to a description of the article itself.

Carbolic acid was discovered by Runge in wood tar in 1834, and was so called by him. It is a pity that other chemists have not adhered to the original name, as we should thus have been saved much confusion. Six years after Runge's original discovery, a French chemist named Laurent made some of the pure acid, and proposed to call it Phenylhydrate, from a Greek word meaning to illuminate, because it was supposed to be a constituent of illuminating gas; and still later, such names as phenylic acid, phenol, phenyl alcohol, coal tar creosote, coal oil acid, phenylous acid, and sundry others, were proposed. All of them ought to be dropped, and the original name of carbolic acid retained. It is really and truly an acid, capable of combining with bases to form salts, but is not strong enough to drive out many other acids from their compounds.

Carbolic acid has been found ready formed in the bile and urine of various animals, and is the product of the dry distillation of vegetable matter; and can be made by conducting the vapor of acetic acid or alcohol through a red hot tube. For technical purposes, it is almost exclusively made from coal tar, and as its boiling point is between 360° and 365° Fah., it is from the dead oil that the greater portion is obtained.

The details of the manufacture of carbolic acid may be consulted in works on chemistry, but its properties and uses may well occupy our attention for a few paragraphs. When pure, it consist of long needles of a peculiar, smoky odor and caustic burning taste; its specific gravity is 1·066, and it fuses at about 98° Fah. It absorbs moisture from the air, and runs to water, and it requires twenty times its weight of water to dissolve it. Alcohol and ether dissolve it in all proportions, and acetic acid is a better solvent than water. Concentrated solutions act powerfully on the skin, turning it white and afterwards red brown, and the spots afterwards peel off. Gelatin and albumen are precipitated by it, and this property has suggested its use in tanning. It is a dangerous poison; a few drops will kill a dog, and plants are at once destroyed by a weak aqueous solution.

Runge recommended carbolic acid for embalming bodies, and as a disinfectant, and tried many experiments to show its value for this purpose; but little attention was bestowed upon his assertions, and it is only recently that the substance has obtained proper recognition from medical and other authorities.

Extensive use is now made of carbolic acid to destroy the odor of stables; a carbolate of lime is prepared and sold for this purpose. As an insect exterminator, few agents can be compared with carbolic acid, and it is naturally applied by physicians for such cutaneous diseases as are caused by insect life. Several cases of death have been reported in consequence of an incautious use for this purpose. Three women, who bathed themselves with a sponge with carbolic acid, to cure the itch, were immediately attacked by dizziness, and soon became unconscious. Two of them subsequently died, and the life of the other was saved with difficulty. When used as a wash for men and the lower animals, it must be taken very weak, and in small quantities at a time. Dogs have been sadly tortured by it, in the vain hope of killing fleas.

The odor of carbolic acid is sometimes disguised by mixing it with camphor, when it is required to keep moths out of furs and clothing. No doubt, the preservative property of coal tar is largely due to the presence of this powerful agent.

All manner of soaps, ointments, and even troches, are made with carbolic acid, which must be used with caution, as the poisonous character of the acid suggests at once that it ought not to be tampered with. A new application of carbolic acid is proposed nearly every week, and it has become one of the most important of our chemical products.

SCIENTIFIC INTELLIGENCE.

DANGEROUS WELL WATER.

It frequently happens that wells, which at one time were supplied with pure and fresh water, in the progress of building and change in population become contaminated with organic matter, having its source in cesspools, outhouses, and the like. A convenient way of testing whether the well is subject to external influences, is to employ a salt of lithium. For example, pour into the cesspool a small quantity of a soluble salt of lithia, and after a few hours, test the well water to see if any of the lithia has percolated through the soil. The least trace of lithia can be shown through the spectroscope, and a subterranean connection, with the well, at once determined.

There is nothing more dangerous than organic matter in drinking water. To such impurities have been traced many cases of typhoid fever, cholera, and other epidemics; and too much caution cannot therefore be observed in the location of wells. On the upper part of the island of New York are numerous wells, that, from the nature of things, must be simple reservoirs for the open drains of those wards. They are fever receptacles, and must be the occasion of much of the sickness that is known to prevail there. On the corner of Eighty-second street and Eleventh avenue is a well that has been used for forty years by the pupils of a large public school. It was formerly in the country, but now is surrounded by houses, privies, and open sewers, and must be a perfect mine of disease. If the chemists of the Board of Health were to try the lithia experiment, and thus trace a connection with the open privy of the school, they would be able to see if it were safe to permit the children to use such water; and they could also pronounce the privy a nuisance to the vicinity. In London, all such wells have been suppressed by the government; but not until the lives of many persons were sacrificed to the apathy and ignorance of the authorities.

The insidious character of water cannot always be determined by a direct chemical analysis, and the taste of soft water becomes more palatable than that of hard, so that it is better, if possible, to prove a connection with drains or pools, in order to frighten persons from using from unwholesome wells. As lithia is not a poison, its use for this test can be safely tried.

SILVERING GLASS.

An easy method is as follows: Nine hundred cubic centimeters of distilled water is mixed with 90 cubic centimeters of a solution of Rochelle salts (1·50) in a flask and boiled; 20 cubic centimeters of a solution of nitrate of silver (1·18) are carefully dropped in, and the whole again boiled. In this way, a reducing solution is obtained containing oxytartrate of silver. This standard solution can be kept any length of time; in fact, it improves by age. A second stock bottle is prepared by adding ammonia to a solution of nitrate of silver, until the precipitate is entirely dissolved, filtering and diluting with water, until there is one gramme of the sil-

ver salt in 100 cubic centimeters of the liquid. For use, take equal quantities of the two stock solutions, pour them into a suitable dish, and immerse the well cleaned glass until it is sufficiently coated.

The layer of silver must be polished by good lac varnish. The excess of silver can be reclaimed from the bath in the usual way. As Rochelle salts are now a cheap article of commerce, and the actual amount of silver employed is very small, this method is one of the most economical of any thus far proposed, and it is also perfectly easy of execution.

STATISTICS OF ANILINE COLORS.

It is estimated that 10,000 pounds of aniline oil are manufactured every day in Europe. Of this, Germany consumes 2,000,000 pounds annually, and the remainder is distributed over France, Holland, Switzerland, and England. There are no aniline factories in Russia, and the amount made in the United States is scarcely worth mentioning. Although England is the chief producer of benzole, it is said to import most of its aniline oil from France. The total annual value of the aniline production is put down at nearly $5,000,000. This is doing pretty well for an industry that had no existence fifteen years ago.

DEATH OF WILHELM VON HAIDINGER.

The death of Wilhelm von Haidinger, of Vienna, one of the most celebrated mineralogists of Europe, is announced in our foreign exchanges. He was born February 5, 1795, and was consequently in his 77th year at the time of his death. His father before him was Professor of Mining and Engineering, and Director of the Natural History Cabinets in Vienna, so that the son came naturally by a love for science. Haidinger studied at Freiberg, afterwards resided several years as private tutor, in the family of the banker Allan in Edinburgh, and traveled extensively before returning to his native city of Vienna. He has been a prodigious worker and contributor to scientific journals. The number of titles to papers written by him exceeds one hundred, and they are all of a valuable character. They chiefly relate to mineralogy and geology. Haidinger was a gentleman of the old school, a thorough courtier, gentle in manners, refined, of a kindly disposition, and ready to aid the young student by word and deed. No one who ever met him can ever forget the pleasant impression produced by his appearance and bearing. He was the intimate personal friend of such men as Woehler, Liebig, Mitscherlich, Rose, and Humboldt, and was a great favorite with them all. His death is a great loss to science, and a personal affliction to all who knew him.

Reduction of Silver Ore.

Eugene N. Riotte, of San Francisco, Cal., has recently patented an improved process for chloridizing silver ores, of which the following is the specification:

I take any silver ore and mix it with from four to eight per cent of its weight of common salt, more or less, according to the richness of the ore, after which I pulverize the mixture to the degree of fineness commonly required to prepare ore for amalgamation.

In order to accomplish an intimate mixture of the ore and salt, I prefer to crush them together in a dry crushing battery. I then introduce this mixture into the top of a furnace, the shaft of which is vertical or nearly vertical, and which is heated by fireplaces at or near the top, so that a current of heated air, gases, and other products of combustion is continually descending through the shaft.

Care must be taken to introduce the mixture so that it shall fall in separate and finely divided particles, and not in lumps.

As the pulverized mixture falls with the current, the ore and salt are both instantly decomposed, the action of the heat separating the silver from the sulphur, antimony, or other substances combined or mixed with it, and the salt being also, at the same time, decomposed by the gases which are formed by the decomposition of the ore.

The chlorine of the salt then instantly unites with the silver, so that the chlorination of the silver is completed in less than two seconds.

I do not confine myself to the exact proportions of ore and salt specified above, as they are not essential to my process; but I state those proportions which I have found to be most advantageous in practice.

What I claim as new is, the process of chloridizing silver ore by dropping a mixture of pulverized ore and salt, through a vertical or nearly vertical shaft, with the product of combustion.

The Decree of Cannopus.

Mr. Samuel Sharpe, an English gentleman whose profound knowledge of the literature of the Egyptians is without parallel in our day, has translated the inscription in hieroglyphics entitled "The Decree of Cannopus." This work will be appreciated by all students of history and philologists. Mr. Sharpe is another instance of the high culture of the intellect to which commercial men sometimes attain. Like Sir John Lubbock the ethnologist, Mr. Geo. Grote the historian of Greece, and the late Samuel Rogers the poet, Mr. Sharpe, who is the nephew of Rogers, was, for nearly all his life, a London banker, but retired from business some years ago.

Cannopus, sometimes improperly spelt Canopus and Canobus, was a water god in the Egyptian mythology, and his effigy decorates many of the urns and vases that illustrate the fine arts of the ancient people. The deity was worshipped up to the time of the first Ptolemy, when Serapis became the supreme power in Egyptian religion. Cannopus gave the name to a city in Lower Egypt, near the most westerly mouth of the Nile.

WE read of a discovery of fossil ivory, in prodigious quantities, in Alaska.

Tunnel between Hecla and Etna.

A native of Iceland recently delivered a lecture in London, descriptive of that remarkable island. He began by a edscription of the country, its position and extent, its most remarkable geographical features, its vast ice-covered mountains and numerous volcanoes, on account of which Mr. Carlyle termed it "the battle field of frost and fire." The largest of these ice mountains, Vatnajokull, covers an area of about 3,500 square miles, and the highest of its peaks, Prafajokull, rises 6,300 feet above the level of the sea. Mr. Hjaltalin drew a vivid picture of the grand and beautiful effect of these icy mountains seen under the different aspects afforded by the changes from a brilliant sunshine to a dark and clouded atmosphere.

That the island owed its existence entirely to submarine volcanic agency, having, at some very early period of geological history, been thrown from the depths of the sea, is proved by every hill and mountain. From the formation of these mountains, it is apparent that many convulsions, at long intervals, took place, ere the volcanic island was brought to its present shape. In confirmation of this statement, Mr. Hjaltalin described the upheaval, which took place towards the latter end of the last century, of an island not far from the part of the coast where Keykjavik is situated. It was preceded by shocks like those of an earthquake, felt by passing navigators, who, at the same time, observed the water to be discolored and agitated. Columns of steam arose, then flames; the sea was covered with pumice and cinders, and then a cone with a crater in the center appeared, and scoriæ, pumice, and ashes accumulated, until it became an island. The volcanic power which had brought it to the surface subsided before it was firmly fixed in its position, and it afterwards sank again beneath the sea.

Mr. Hjaltalin then noticed the opinion, very generally received among scientific men of all countries, that there is an underground connection between the volcanoes of Hecla, in Iceland, and Etna, in Sicily—a tunnel, of which the tw mountains form the mouths. A peculiarity of the Icelandi volcanoes is their sending forth streams of boiling watec with the lava currents. The volcanic ice mountains throw off their icy covers at the beginning of an eruption, which are floated down to the lowlands or the sea by the water cast forth from the volcano.

He then described the hot springs which are found all over Iceland. The principal of these is the far-famed Geyser, from which we have incorrectly called all the hot springs "geysers"—a mistake, he observed, as ridiculous to an Icelander as it would be to us if he were to speak of all the rivers of England as "Thameses." Next in importance to the Geyser (*saging*) is the *Strak Kur* ("a churn"), which is, in one respect, more remarkable, as, when quiescent, it can be made to perform by throwing in sods and stones in considerable quantities. The hot springs often increase and decrease in activity, disappearing sometimes in one place and reappearing in another.

Improvement in the Manufacture of Salt.

Samuel D. Gilson, of Syracuse, has recently patented the following improvements:

A tank or bath is provided, made of wood or metal, but so constructed as to resist the chemical action of the brine when placed therein. At the upper part of the tank, steam heated cylinders are arranged, the lower portions of which dip into the brine.

In using the apparatus, steam, water, or hot air, is let into the cylinders, and motion being applied to them, as the surface of the cylinders successively revolves within the brine, a film of salt will be deposited thereon, which is dried in part by the cylinders.

As the salt accumulates upon the cylinders, it gradually falls off by its own gravity, and descends to the bottom of the tank, but the salt thus produced is of a coarse quality.

When it is desired to make a fine quality of salt, a steam heated chest, which is provided with a knife, is moved toward the cylinder or cylinders, and so adjusted as to scrape the salt off in the required degree of fineness; and as the salt falls off on to the chest, it is quickly dried and ready for use.

The impurities which gather upon the revolving cylinders, such as lime, iron, etc., before the salt water is reduced to brine, are removed by the knife, as before described.

It is stated that salt of the best quality can be manufactured very economically by this apparatus.

Electroplated Signs.

John J. Pratt, of New York city, has lately patented the following improvement in electroplating signs, etc.

Upon the surface of sheets of polished brass, copper, tin, steel, or iron, of the requisite dimensions, the letters, numbers, and the like are laid off and covered with asphaltum, black varnish, or any paint or material that will resist the acids or chemicals used in electroplating. The sheets thus prepared are covered with a coat of nickel or silver plating, leaving the letters intact, and not plated; then the signs are burnished, which removes the paint, leaving the letters depressed below the plating. They can be painted to suit the taste, or, if upon brass or copper, can be left without coloring. He claims:

1. The improved process for forming letters, figures, and the like on metal plates, herein shown and described.

2. The new manufacture herein described, using metal plates suitable for signs, door plates, or labels, with letters or figures formed by electroplating as set forth.

IT is the most beautiful and humane thing in the world, so to mingle gravity and pleasure that the one may not sink into melancholy, nor the other rise up into wantonness.—PLINY.

EDITORIAL SUMMARY.

POWER FOR LESS THAN NOTHING.—The Philadelphia *Trade Journal* announces a discovery, by which petroleum can be used for fuel, and the waste product be sold at a lighter price than the crude oil costs. The theory is that the lighter and more volatile constituents of the mineral oil will be consumed, leaving the heavy lubricating fluid in the furnace. The residue is the more valuable part of the petroleum, and is separated in the combustion of the other components. The description includes, among many novel features, a four-horse engine, which was run for ten hours, at an expense of fifty-five cents.

ACTION IS MAN'S SALVATION.—Men who have half a dozen irons in the fire are not the ones to go crazy. It is the man of voluntary or compelled leisure, who mopes and pines and thinks himself into the mad house or the grave. Motion is all nature's law. Action is man's salvation, physical and mental; and yet nine or ten are wistfully looking forward to the coveted hour when they shall have leisure to do nothing—the very siren that has lured to death many a "successful" man. He only is truly wise who lays himself out to work till life's latest hour, and that is the man who will live the longest, and will live to most purpose.

IN Edinburgh a new musical instrument is now being exhibited. It is described in the *English Mechanic* as a keyed instrument of six octaves, resembling an harmonium in general form, but very different in mechanism. The sounds are produced by the friction of wooden hammers against a revolving cylinder of wood, set in motion by the feet. The tones produced are said to be very sweet and wonderfully varied. "One can sometimes hardly believe they are not those of a wind instrument."

CHAPPED HANDS.—It is said that honey is an unfailing preventive for chapped hands. When washing the hands, or rather having washed them, while they are still wet, rub on them a little honey, and then dry them, taking care to leave the honey on, and not rinse it off before drying the hands. If the hands are sore and chapped, on the first and second application the honey will cause pain for about five minutes, but if used every time the hands are washed, the hands never chap. It is also a cure for irritation on the face caused by wind and cold weather.

THE ELECTRIC LIGHT IN WARFARE.—An experiment has been made at St. Petersburg, with the view of ascertaining whether the electric light is capable of being turned to account in night warfare. The trial proved completely successful. With an ordinary piece of field artillery, the experimenters succeeded in lodging every ball in a target, at a distance of 1,600 yards. Not merely the target, but also surrounding objects, to a considerable distance, were rendered perfectly distinct, in spite of the darkness of the night.

A MAN at Peabody, Mass., who has been treated for more than a year for paralysis of the throat, and who was for some time able to take only liquid nourishment, recently coughed up an upper set of false teeth, which he had swallowed in his sleep fifteen months before, and which, lodging in the lower part of the throat, had been the cause of all his troubles. The teeth were missed at the time, hunted for, but never found, and nobody had suspected the place of their concealment.

IT is a curious fact that our hat and cap manufacturers in different localities, use different sizes of hats and caps as standards. Boston and the eastern states use the smallest sizes, New York and the middle states use the medium to largest sizes, and Chicago and the western states require the largest sizes. Goods manufactured for one market cannot be sold for the other, only in exceptional cases. The South use a shape peculiar to themselves and of a large size.

A CROWBAR WITH JOINTS.—Among the implements found in the possession of two burglars, when arrested in Norristown, Pa., was a crowbar, jointed so as to admit of being folded up and carried in an ordinary sized satchel. When extended to its full length, it was nearly six feet long, and when the joints were covered with stout rings, the implement was a powerful lever.

IN the museum at Cassel, Germany, is a library made from 500 European trees. The back of each volume is formed of the bark of a tree, the sides, of the perfect wood, the top, of young wood, and the bottom, of old. When opened, the book is found to be a box, containing the flower, seed, fruit, and leaves of the tree, either dried or imitated in wax.

UNDERDRAINING.—Surface water that flows off the land instead of passing through the soil, carries with it whatever fertilizing matter it may contain, and abstracts some from the earth. If it pass down through the soil to drain, this waste is arrested.

A NEW KIND OF LEATHER.—Fifty skins of the anaconda snake have, it is said, been tanned by Schayer Brothers, at the Boston Highlands, for boot leather. The largest of the skins was forty feet in length. The tanning process was similar to that observed in the manufacture of alligator leather.

A WISE SAYING.—It is related of an English farmer that he condensed his practical experience into this rule, "Feed your land before it is hungry, rest it before it is weary, and weed it before it is foul."

AN honest employment is the best inheritance that can fall to any one.

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, One Dollar and a Half per Line will be charged.

Lubricators.—For swift-running or heavy machinery, bolt and screw cutting, looms, and sewing machines, Chard & Howe, 134 Maiden Lane, N.Y., have the cheapest and best. Send for sample and price list.

"507 Mechanical Movements."—This valuable work, now in its 6th Edition, is a complete illustrated table of Mechanical Movements. Mechanics, Inventors, and others, will find it indispensable for reference and study. Price $1. By mail, $1.12. Theo. Tusch, 37 Park Row, New York.

The paper that meets the eye of manufacturers throughout the United States—Boston Bulletin, $4 00 a year. Advertisements 17c. a line.

Contractors get early information of contracts to be let in the Railroad Gazette.

Belting that is Belting.—Always send for the Best Philadelphia Oak-Tanned, to C. W. Arny, Manufacturer, 301 Cherry st., Phil'a.

Send your address to Howard & Co., No. 865 Broadway, New York, and by return mail you will receive their Descriptive Price List of Waltham Watches. All prices reduced since February 1st.

Wanted.—A second-hand Otis Brothers' 6 to 8 inch cylinder Hoisting Engine, with patent automaton stop mechanism, that has been used but a short time. Address, stating price, size, and full particulars, P.O. Box 1476, New York.

Balloons made to order, with instructions, by John Wise, Lancaster, Pa.

Wanted.—25 to 30 feet second-hand Steam Launch, or boiler and machinery for one. Parties wishing to sell cheap may address E. J. H., P.O. Box 136, Addison, N. Y., giving description, weight, condition, and price, and stating where it can be seen.

I have a cheap water motor for Sewing Machines, or any H.P.'s, thoroughly successful, for sale, whole or in part. R. H. Atwell, Baltimore, Md.

Wanted.—A Partner, with capital, to manufacture a valuable Agricultural Implement. Address Louis de Mortemer, Chaptico, Md.

Ashcroft's Low Water Detector, $15; thousands in use; can be applied for less than $1. Names of corporations having thirty in use can be given. Send for circular. E. H. Ashcroft, Boston, Mass.

Diamond Carbon, of all sizes and shapes, furnished for drilling rock, sawing and turning stone, conglomerates, or other hard substances also Glazier's Diamonds, by John Dickinson, 64 Nassau st., New York.

Gage Lathes for Broom and other handles, Chair Rounds, etc. Price $30. With attachment for Nail work, price $80. Also, Wood-turning Lathes. A. L. Henderer & Co., Binghamton, N.Y.

E. P. Peacock, Manufacturer of Cutting Dies, Press Work. Patent Articles in Metals, etc. 55 Franklin st., Chicago.

Peck's Patent Drop Press. Milo Peck & Co., New Haven, Ct.

Wanted.—A practical Mechanic, who thoroughly understands manufacturing Chairs, Bedsteads, and other Furniture, as manager. Must be able to take an interest in the business, now in operation. For particulars address "Mason," P. O. Box 2960, New York.

To Cotton Pressers, Storage Men, and Freighters.—35-horse Engine and Boiler, with two Hydraulic Cotton Presses, capable of pressing 36 bales an hour. Machinery first class. Price extremely low. Wm. D. Andrews & Bro., 414 Water st. New York.

Twelve-horse Engine and Boiler, Paint Grinding Machinery, Feed Pumps, two Martin Boilers, suitable for Fish Factory. Wm. D. Andrews & Bro., 414 Water st., New York.

Wanted.—An Automatic Power to run a small Fan, 6 in. vanes, at 300 revolutions per minute. Address Lock Box 123, Pittsburgh, Pa.

Use Rawhide Sash Cord for heavy weights. It makes the best round belting. Darrow Manufacturing Co., Bristol, Conn.

For the best 15-in. Swing Engine Lathe, at the lowest price, address Star Tool Co., Providence, R.I.

American Boiler Powder Co., P. O. Box 315, Pittsburgh, Pa.

Winans' Boiler Powder.—15 years' practical use proves this a cheap, efficient, safe prevention of Incrustations. 11 Wall st., New York.

Mechanical Draftsman wanted.—One experienced and expert in getting up machinery will find permanent employment, with liberal weekly pay. Address E. H. Stearns, Erie, Pa.

See advertisement of L. & J. W. Feuchtwanger, Chemists, N.Y.

Carpenters wanted—$10 per day—to sell the Burglar Proof Sash Lock. Address G. S. Lacey, 27 Park Row, New York.

Manufacturers' and Patentees' Agencies, for the sale of manufactured goods on the Pacific coast, wanted by Nathan Joseph & Co., 619 Washington street, San Francisco, who are already acting for several firms in the United States and Europe, to whom they can give references.

All parties wanting a water wheel will learn something of interest by addressing P. H. Wait, Sandy Hill, N.Y., for a free circular of his Hudson River Champion Turbine.

Self-testing Steam Gage. There's a difference between a chronometer watch and a "bull's eye." Same difference between a self-tester and common steam gage. Send for Circular. E. H. Ashcroft, Boston, Mass.

E. Howard & Co., Boston, make the best Stem-winding Watch in the country. Ask for it at all the dealers. Office 15 Maiden Lane, N.Y.

For mining, wrecking, pumping, drainage, and irrigating machinery, see advertisement of Andrews' Patents in another column.

Brown's Coalyard Quarry & Contractors' Apparatus for hoisting and conveying material by iron cable. W.D. Andrews & Bro, 414 Water st., N.Y.

Improved Foot Lathes. Many a reader of this paper has one of them. Selling in all parts of the country, Canada, Europe, etc. Catalogue free. N. H. Baldwin, Laconia, N. H.

Cold Rolled-Shafting, piston rods, pump rods, Collins pat. double compression couplings, manufactured by Jones & Laughlins, Pittsburgh, Pa.

For Solid Wrought-iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

The Merriman Bolt Cutter—the best made. Send for circulars. H. B. Brown & Co., 25 Whitney ave., New Haven, Conn.

Glynn's Anti-Incrustator for Steam Boilers—The only reliable preventive. No foaming, and does not attack metals of boilers. Price 25 cents per lb. C. D. Fredricks, 587 Broadway, New York.

For Fruit-Can Tools, Presses, Dies for all Metals, apply to Bliss & Williams, successor to May & Bliss, 118, 120, and 122 Plymouth st., Brooklyn, N.Y. Send for catalogue.

Presses, Dies, and Tinners' Tools. Conor & Mays, late Mays & Bliss, 4 to 6 Water st., opposite Fulton Ferry, Brooklyn, N.Y.

English and American Cotton Machinery and Yarns, Beam Warps and Machine Tools. Thos. Pray, Jr., 57 Weybosset st. Providence, R.I.

Taft's Portable Hot Air, Vapor and Shower Bathing Apparatus. Address Portable Bath Co., Sag Harbor, N.Y. (Send for Circular.)

To Ascertain where there will be a demand for new machinery or manufacturers' supplies read Boston Commercial Bulletin's Manufacturing News of the United States. Terms $4 00 a year.

"Of Late Years Advertising

Has assumed a very important phase—in fact, has become a science in business; and no one has done more, or as much, to make it so, as Geo. P. Rowell & Co., of New York. Their prompt and systematic mode of transacting their business has gained the confidence of all large advertisers, and has raised them in a few years from one of the smallest to the leading advertising house in the world."—*Maple Leaves.*

Answers to Correspondents.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisements at 1·00 a line, under the head of "Business and Personal."

ALL reference to back numbers must be by volume and page.

Imitation of Ebony.—E. E. B. can make imitation ebony by using a dye of logwood, galls, and sulphate or acetate of iron; but it will always look dull and unnatural unless he knows how to polish it, when it will come out a most brilliant, shiny black. It is done in this way: Put the dyed or finished article in the lathe, turn at great speed, and while in revolution, firmly and evenly press the siliceous rind of bamboo or a hard wood burnisher against the article, and continue the operation till all the grain is reduced into a smooth glossy surface. The bamboo is best, it is so unyielding and hard in texture. Smooth flat work, not adapted to a lathe, must be rubbed till a polish is obtained.

Cement for Marble.—Let C. H. P. sift plaster of Paris through muslin, and mix it with shellac dissolved in alcohol, or naphtha. As soon as mixed, apply quickly, and squeeze out as much of the composition as possible, wiping off that which squeezes out before it sets. The cement will hold better, if the parts to be joined be roughened by a pointed tool before cementing. This can be done without breaking off the edges of the fractured parts. Plaster of Paris used with white of egg also makes a good cement, but it must be used with expedition.

Telescope.—W. B. can make a telescope of sufficient power to see the rings and satellites of Saturn. Object glass, 3 inches in diameter, 20 in focus. Achromatic, 3 double convex lenses, 1 inch in diameter, set 1½ inches apart, constituting the eye piece. He can set these lenses in brass or paper tubing, if he be sufficiently skillful.—A. W. G., of Mich.

A. W. G., of Mich.—It is getting more and more difficult to obtain situations as apprentices in machine shops, owing to depression in business, and glut of applications. The only way for you to do is to keep trying.

Cement for Leaks in Gas Holders.—In answer to F. C. I would say that I repaired an extremely leaky gas holder by putting red lead over the leaks, and then painting the whole with the "Ritchie Mineral Paint." That was two years ago. The gas holder has received one coat of paint since, but it has never leaked.—I. H. F., of Md.

Cement for Gas Holders.—If F. C. does not find a cement for his gas holder, insoluble in both oil and water, let him caulk the leaky spots in the seams with tin foil; heavy tobacco foil is the best. I had a 1,000 feet holder, for gas made from the lighter products of petroleum, which leaked very badly, and none of the usual cements, paints, varnishes, or tar, would stop the leaks; an afternoon in a dentist's chair, having teeth filled, suggested a similar process for my disabled gas holder, and it was a success.—J. T. W., of Mass.

W. C. A., of Mass.—The article entitled "A Wonder in Weaving," was taken from another paper, for whose enthusiastic opinions we do not hold ourselves responsible. Indeed, a careful perusal of our own introductory clause will show you that we had doubts whether the statements made were supported by facts.

E. B., of Iowa.—To answer the question, what attempts have been made to make a device that would make a crank pass its dead centers without a fly wheel? would take too much space. We can say, however, that none have ever been found a good substitute for the fly wheel, for heavy work. Some devices have been made that will do for very light work, such as gas-meter registers and the like.

H. A. C., of Ca.—You cannot set fire to wood by steam escaping into the air from a pipe, no matter what may be the temperature in the boiler or pipe. The steam in escaping expands so as to reduce its temperature almost instantly to 212°.

S. S., of Va.—Your suggestions in regard to forcing air through moist porous materials, for removing dust in the ventilation of cars, funnels being employed to collect the air, have already been acted upon, and are now in use on some roads. Your suggestions in regard to heating cars have also been used.

L. B. S., of Tenn.—To keep polished iron work from rusting in salt air, coat it with mercurial ointment, or what answers nearly as well, with a mixture of mutton tallow (free from salt) and white lead, applied in a melted state. When the machinery is to be used, the coating can be removed by slightly warming the metal.

Composition for Matches.—B. H. will find recipes for this in Dr. Chase's "Recipe Book," also in Dussauce's "Treatise on the Manufacture of Matches," published by H. Carey Baird, Philadelphia, Pa.—A. W. G., of Mich.

Furniture Varnish.—Best alcohol, 1 gallon, gum shellac, 2½ pounds. Place the vessel containing these ingredients in a warm place, till the gum is dissolved.—H. W. G., of Mich.

A. D. F., of D. C.—The washing of banks by canal boats is due altogether to swells, caused by the propellers, unless they are propelled at such speed as to make a bow swell. Such speed is not allowable.

S. S., of Va.—We advise you to admit air to your furnace, when burning the "ross" of oak bark, at or near the first bridge wall, through openings made in the masonry, and provided with dampers to regulate the admission. We are sure this will obviate all the smoke nuisance and add to the economical working of your furnace.

J. B., of N. Y.—There is no such thing as an electroplating machine. The apparatus employed, is a galvanic battery, and is described in almost every chemical or natural philosophy book.

N. T. W., of Me.—The mineral you send appears to be a sulphuret of antimony, containing some lead and probably silver. It may be of value. Briefly, the way to reduce this ore is by means of a close crucible with borax and charcoal.

J. S. H.—Select a refrigerator from any good maker, and you cannot go astray.

NEW BOOKS AND PUBLICATIONS.

The *American Journal of Microscopy* is the title of a new monthly publication, published at Chicago, Ill., by G. Mead & Co. $2·00 a year. E. M. Hale, M.D., Editor. The contents of the first number are quite interesting. We are glad to welcome this new candidate for public favor, and trust it may find liberal and prompt support.

Queries.

[We present herewith a series of inquiries embracing a variety of topics of greater or less general interest. The questions are simple, it is true, but we prefer to elicit practical answers from our readers.

1.—Waterproof Paper.—I am in want of a paper which shall be waterproof, and yet have the same appearance as common paper. Can any of your correspondents give me the desired article, or the process for making the same?—Z. M. J.

2.—Paint.—Will some practical painter tell me why mixed paints become "fat?"—J. B.

3.—Singular Occurrence.—I used a brass bell wire to connect my room with my office (for bell), being about fifty feet long, running very near east and west, and upwards at about an angle of 40°. After being up about twelve months, the wire was found to be cracked, perhaps in a thousand or more places, leaving only a small particle to keep it together. What is the explanation?—J. H.

4.—Wooden Railway.—Which is the best kind and size of wood for a wooden railroad, for four wheel cars, weighing ten tuns loaded?—E. R. C.

5.—Preserving Flowers.—Will some one give me the recipe for a process of preserving flowers, that will also preserve the colors? Also for a good cement for aquaria, white preferred?—T. E. L.

6.—Ink Stains in Marble.—What will take ink stains out of marble?—J. L.

7.—Rancid Butter.—Is there any chemical process for restoring rancid butter, that is, removing its bad taste and smell?—R.

8.—Cheap Hydrogen.—I want a safe and cheap method of making hydrogen.—J. H. F.

9.—Stencil Ink.—I desire a good ink for stenciling on on cases. I have been using chrome ink, and am not satisfied with it. I want something that will not coat the stencils over, but leave them clean, as I have experienced a great deal of inconvenience in using inks that collect on the stencils and leave them foul.—C. T. D.

10.—Impervious Material.—What is the best material entirely impervious to all the vegetable, animal, and mineral oils (particularly the latter), having a great degree of flexibility, durable, but not necessarily elastic?

11.—Lens for Magic Lantern.—How large a lens must I use to make a magic lantern, that will show a circle six feet in diameter at a reasonable distance from the instrument? What should be the focal distance, and how near the inside lens ought the light to be placed?

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]

APPLICATIONS FOR LETTERS PATENT.

826.—Mode of Supplying Paper to Printing Presses.—Olof Nilson, Red Wing, Minn. March 28, 1871.

833.—Machinery for Washing and Separating Ores.—John Collom, Houghton, Mich. March 28, 1871.

838.—Steam Pumping Engines and Valves, Valve Gear, etc.—Adam S. Cameron, New York city. March 29, 1871.

842.—Revolving Oven.— . Curtis, Mishawaka, and C. B. Graham, South Bend, Ind. March 29, 1871.

849.—Mold Draining, and Drying Sugar.—A. F. W. Partz, San Francisco, Cal. March 30, . 71.

857.—Manufacture of Illuminating Gas—Darius Davidson, New York city. March 30, 1871.

866.—Iron and Steel.—Charles M. Nes, York, Pa. March 31, 1871.

867.—Washing Machine.—Albert Assmann, Rahway, N. J. March 31, 1871.

Foreign Patents.

The population of Great Britain, is 31,000,000; of France, 37,000,000 Belgium, 5,000,000; Austria, 36,000,000; Prussia, 40,000,000; and Russia, 70,000,000. Patents may be secured by American citizens in all of these countries. Now is the time, while business is dull at home, to take advantage of these immense foreign fields. Mechanical improvements of all kinds are always in demand in Europe. There will never be a better time than the present to take patents abroad. We have reliable business connections with the principal capitals of Europe. A large share of all the patents secured in foreign countries by Americans are obtained through our Agency. Address Munn & Co., 37 Park Row, New York. Circulars, with full information on foreign patents, furnished free.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

Broiler.—William Thompson Howard, Baltimore, Md.—This invention has for its object to prevent the liquid fat, which exudes from meat during the process of broiling, from falling into the fire, and thence sending up smoke and flame, which scorch and fumigate the meat, and also to save the fat and gravy by means of a receptacle below the broiler, and also to prevent the meat from coming into contact with, and being fried in, the fat in the broiler.

Horse Collars.—John W. Schwaner, Egg Harbor City, N. J.—This invention has for its object to improve the construction of horse collars, so that they may fit more closely to the horse's neck, be more easy upon the horse, retain their form better, be stronger, more durable, and be more easily made, and more readily put on and taken off the horse, than collars constructed in the ordinary manner.

Dies for Forming Horse Collar Shells.—John W. Schwaner, Egg Harbor City, N. J.—This invention has for its object to furnish improved dies for forming the shells or foundation plates for horse collars.

Corn Planter.—Rev. G. J. Vaught, Hanby, Ky.—This invention has for its object to furnish an improved corn planter which shall be simple in construction, and convenient, accurate, and reliable in operation, and which shall be so constructed as to furrow the ground, drop, and cover the seed, and remove any clods that may be left upon the hills, leaving the seed uniformly covered to any desired depth.

Barrel Rolling Apparatus.—Lewis L. Ryatt, New York city, and Adolph G. Hüpfel, Morrisania, N. Y.—This invention has for its object to furnish an improved apparatus for rolling barrels, which have been coated with pitch or other similar substance, to keep the said substance spread over the surface of the barrel, until cooled, and which shall be simple in construction, easily operated, and effective in operation.

Plumbago Oil Cans.—Donald D. Mackay, Whitestone, and Cyrus Butler, New York city.—This invention relates to improvements in oil cans, and it consists in a combination, with an oil can, of a stirring apparatus, arranged in a simple manner, to be actuated by the same hand by which the can is taken for use, to stir the oil rapidly before using, to thoroughly mix the plumbago or other substance, which is not soluble in the oil, with the latter.

Spittoon Lifter.—James Walker and H. F. Lilly, Philadelphia, Pa.—This invention relates to a new and useful improvement in an implement for lifting spittoons and other hollow vessels, and for other purposes, as solid or spherical bodies, cannon balls, etc.

Sectional Ceiling and Walls for Buildings.—Charles N. Poole, Sandwich, Ill.—This invention relates to a new and useful improvement in mode of finishing the inside of dwelling houses and other buildings, and consists in putting on the finish of the walls and ceiling in sections so that the ordinary mode of finishing by plastering is dispensed with.

RAILROAD CAR COUPLING.—Lycurgus Jedson Bosworth, Monmouth, Ill.—This invention has for its object to produce a car coupling which will be readily opened or closed by convenient means, and become automatically uncoupled whenever the cars run off the track. The invention consists in a novel combination of a sliding ring on the handbar with an adjusting lever, pivoted jaw, and headed coupling link, all arranged in conjunction with each other, to operate in the stated manner.

WATERPROOF FLOORS.—Tobias New, New York city.—This invention relates to a new and useful improvement in constructing waterproof floors for packing houses and stables, and for all purposes for which such floors are desired.

COTTON SEED AND GUANO DRILL.—Leonidas M. Rhodes and Christian N. Rhodes, Warrenton, Ga.—This invention relates to a new and useful improvement in drills for planting cotton and other seeds with guano or other fertilizer.

PLANING TOOL.—Nathaniel Russell, Plymouth, Mass.—This invention relates to a new and useful improvement in tools for planing wood and metals, and consists in a series of steel plates confined in a hollow block or case by means of screws or keys.

OPERATING WATER WHEEL.—John S. Warren, Fishkill on the Hudson N. Y.—This invention relates to a new and useful improvement in mode of operating the chutes of water wheels.

PISTON PACKING.—John C. Merriam, Olneyville, R.I.—This invention has for its object to furnish an improved packing for steam engines, pumps, etc., which shall be so formed that the argillaceous clay or other powdered mineral cannot be blown off by the steam.

[Mr. Merriam was formerly editor of the *American Engineer*, and the clay he uses comes from a mountain in Vermont. The deposit was discovered by a Californian, and it is claimed to possess lubricating qualities not inferior to plumbago. A company under the name of "Clay Packing Company" has been formed, and further information may be had by addressing P.O. box 534, Providence, R. I.]

TRACTION ENGINE.—J. W. Hazen, West Hartford, Vt.—This invention has for its object to furnish an improved traction engine for drawing plows, and for other uses, and which shall be simple in construction and effective in operation.

COMBINED CIDER MILL AND PRESS.—Daniel H. Krauser, Pottsville, Pa.—This invention relates to new and useful improvements in mills for grinding and pressing fruit in the manufacture of cider or wine, and for similar purposes.

TILE DITCHER.—Isaac T. Baker, Gratiot, Ohio.—This invention relates to a new and useful improvement in machines for cutting ditches for drain tiles, and it consists in a hollow curved bed plate, or trough, provided with a share, or cutting edge, and with an adjustable beam.

EXTENSION PULLEY.—William Onions and Isaac Bagnall, St. Louis, Mo.—This invention relates to a new and useful improvement in pulleys for driving machinery, and consists in making the pulley in sections, and constructing and arranging the sections in such a manner that the diameter of the pulley may be increased or diminished, so as to vary the speed of the machinery without moving or changing the belt, or stopping the motion.

COKE FURNACE FOR HEATING SOLDERING IRONS.—Conrad Seimel, Greenpoint, N.Y.—This invention has for its object to furnish a substitute for the portable charcoal stoves now in use, by plumbers, roofers, and others, for heating soldering irons, and similar purposes, so that in place of the expensive charcoal the cheaper coke can be employed, with equal effect. The invention consists in the arrangement of a furnace having a grate and a peculiar draft apparatus, adapted to the peculiarities of coke.

ATTACHMENT TO OIL WELL TUBING.—William H. Dewey, Tidesoute, Pa.—This invention has for its object to provide means for gathering the oil from well tubes when they are being withdrawn from the well.

DISINFECTING COMPOUND.—Guillaume Vigné, aîné, Bordeaux, France.—The object of this invention is to produce an inexpensive but effective compound for counteracting the offensive and injurious effects of mephitic exhalations, and foul odors of every kind.

APPARATUS FOR COVERING CORDS, ETC.—Reuben Lewis, New York city.—This invention relates to certain improvements in the arrangement of bobbins and apparatus for winding woolen or other yarn around cords or wires, to produce picture cords, stems for artificial flowers, or similar covered goods.

FENDER AND SIFTING ATTACHMENT TO FIRE GRATE.—Wm. H. Ganett, Canonsburgh, Pa.—This invention relates to an attachment to fire grates, for catching the droppings from the grate, sifting the ashes therefrom; and also for preventing fire from falling over the top of the grate; and it consists in a metal pan, or screen of any kind, suspended under the grate, by resting at the rear on studs projecting from the back wall, and at the front by chains from the top bars of the grate, or on studs in the wall thereabout, so that it may be swung back and forth for sifting the cinders, and then be brought forward and its contents emptied on the fire.

BOAT DETACHING APPARATUS.—D. L. Cohen, Pensacola, Fla.—This invention has for its object the detaching of boats from ships, and it consists in so arranging a rod or bar in the bottom of the boat, to connect with the devices by which it is suspended, and providing the same with a tooth, which is engaged by a suitable catch, that, when a locking lever is operated (as may be done by a single movement), the boat will be instantly detached from the davits.

FERRULE.—D. G. Smith, Columbus, Ohio.—This invention relates to improvements in ferrules for spades, forks, and other implements, but more especially such ferrules as have notches in the ends for receiving the shoulders of a fork or spade, or other article having shoulders. The invention consists in the application to the said ferrule of a reinforcing ring of oval, flat, or other form, fitted on to the top end, and driven on tight, and secured by soldering or brazing, or it may be retained by the friction, and by the shoulders of the tool driven into the wood handle, and confined by the ring and ferrule, the said ring being driven on at the same time the shank of the tool is driven into the handle.

DUMPING CAR.—W. A. Sharp, Tama City, Iowa.—This invention relates to improvements in dumping cars, and it consists in an arrangement of the bottom to slide over one or both sides of the car, or, being divided at the center, to slide over each side and tilt; and in connection therewith an arrangement of rigging to effect the movements of the bottom, for dumping and returning by the power of the locomotive, which, being uncoupled from the car, is hitched to such rigging.

COMBINED PLOW AND SCRAPER.—John C. Cameron, Madison Station, Miss. This invention relates to a new and useful improvement in an agricultural implement for cultivating growing crops, more especially designed for cotton, but applicable to other growing crops, and consists in a detachable scraper, which forms a continuation of the mold board on the opposite side of the bar of the plow, projecting over the land side, but attached to the plow in the place of the plow point.

TENONING MACHINE.—M. S. Bourland, Buena Vista, Texas.—This invention relates to a new tenoning machine which is provided with a circular saw for cutting the sides of the tenons and the shoulders formed by the same, and which may also be used for cutting the ends of boards, rails, etc., tapering or at any suitable angle.

SHINGLE MACHINERY.—James Decker, Doctortown, Ga.—This invention relates to improvements in shingle machines, and consists in the application to a reciprocating frame moving over the saw which works horizontally, of a set of holding dogs at each end, provided with novel apparatus for automatically feeding the bolts, and shifting them as required, for changing the bolt relatively to the saw at each cut, for cutting heads and points alternately.

WHIP RACK.—R. J. Anderson, New York city.—This invention relates to improvements in whip racks for livery and other stables, and it consists in one or more tubes arranged vertically above a shelf, on the wall of the building, or any suitable device for attaching thereto, and either inclosed in a case or not, in which tubes the whips are inserted from below, one in each, and the butt ends rested on the shelf below, in a way to keep the whips straight, while remaining therein.

POUND NET.—P. E. Tiernan, Waukegan, Ill.—This invention relates to a new pound net, to be used in rivers or lakes for continually arresting and retaining fish of proper growth and size, and absolutely preventing their escape, when once within the pound. The main object of the invention is to provide a secondary pound or fish receptacle, which will be in action while the main pound is being drawn up to be emptied, and thereby prevent the escape of fish from the heart of the net.

ADDING REGISTER.—C. W. Pyle, Wilmington, Del.—This invention relates to a new apparatus for registering the number of strokes or movements of a reciprocating bar, and is more particularly intended as an attachment for the "Ellis slat machine," although applicable to all other kinds of machinery. The invention consists in a new arrangement of concentric counting rings, and of the case containing the same; also in a new combination of parts for preventing said rings from being turned, one by another, and for imparting the requisite motion thereto.

CUT-OFF FOR BLAST FURNACE.—Henry Davis, Newport, Ky.—This invention relates to a new mechanism for cutting off the blast, for the purpose of letting down the stock in blast furnaces, and consists in a new arrangement of valves, and in an entirely original combination of machinery for regulating the motion of said valves.

RAILWAY SIGNAL APPARATUS.—John Fogarty, Brooklyn, N. Y.—This invention has for its object to furnish an improved signaling apparatus for use upon railways and other places, which shall be simple in construction, easily operated, and may be used for giving signals by day and by night.

MOP.—M. H. Kirkwood and S. H. Riley, Iowa City, Iowa.—This invention relates to improvements in scrubbing mops, and it consists in an improved arrangement of a clamp for holding the rag wiper, and a mode of detachably connecting brushes to it for using either the rag wiper or the brush, and it also consists in the application to the handle of a secondary clamp for holding rag wipers to be used for drying the floor after scrubbing.

APPARATUS FOR DRYING BONE BLACK.—Peter Farley, New York city.—This invention relates to a new apparatus for drying the bone black used in sugar refineries, and for other purposes, and consists in the arrangement of inclined shelves to the outer side of a heating structure, so that said shelves may retain the matter to be dried, and allow it to feed down slowly.

GRAIN HULLING MACHINE.—Michael Hoffman, Munich, Germany.—This invention relates to a new machine for so hulling grain that only the skins which contain the wooden fiber and useless matter will be removed from the grain, the nutritious body of the same being entirely preserved. The invention consists chiefly in the arrangement of a hulling cylinder having alternate circular grooves and ribs within the surrounding shell, which has also alternate circular ribs and grooves, in such manner that the ribs of the cylinder enter the grooves of the shell, and *vice versa*. The grain is, while it passes down between the cylinder and shell, properly peeled or hulled, the matter removed being ejected through sieves in the sides of the shell, while the full grain reaches the bottom of the shell. Finally, the invention consists in providing a sheet metal case around the shell and sieves for preventing the machine from dusting.

APPLICATIONS FOR EXTENSION OF PATENTS.

CENTERING MACHINE.—Edward F. Whiton, Stafford Springs, Conn., has petitioned for an extension of the above patent. Day of hearing, June 28, 1871.

LOCK.—Lyman F. Munger, Rochester, N.Y., has petitioned for an extension of the above patent. Day of hearing, June 28, 1871.

RAILROAD CAR SEATS.—B. J. La Mothe, New York city, has petitioned for an extension of the above patent. Day of hearing, June 28, 1871.

HARVESTER.—John P. Manny, Rockford, Ill., has petitioned for an extension of the above patent. Day of hearing, June 28, 1871.

HARVESTER.—John P. Manny, Rockford, Ill., has petitioned for an extension of the above patent. Day of hearing, June 28, 1871.

COTTON GIN.—Daniel Pratt, Prattville, Ala., has petitioned for an extension of the above patent. Day of hearing, June 28, 1871.

MEANS FOR RENDERING JOINTS STEAM-TIGHT.—Mary J. Kelsey, Brooklyn, N.Y., has petitioned for an extension of the above patent. Day of hearing, July 5, 1871.

RETORT COVERS.—James R. Floyd, New York city, has petitioned for the extension of the above patent. Day of hearing, July 5, 1871.

Value of Extended Patents.

Did patentees realize the fact that their inventions are likely to be more productive of profit during the seven years of extension than the first full term for which their patents were granted, we think more would avail themselves of the extension privilege. Patents granted prior to 1861 may be extended for seven years, for the benefit of the inventor, or of his heirs in case of the decease of the former, by due application to the Patent Office, ninety days before the termination of the patent. The extended time inures to the benefit of the inventor, the assignees under the first term having no rights under the extension, except by special agreement. The Government fee for an extension is $100, and it is necessary that good professional service be obtained to conduct the business before the Patent Office. Full information as to extensions may be had by addressing

MUNN & CO., 37 Park Row.

Official List of Patents.

ISSUED BY THE U. S. PATENT OFFICE.

FOR THE WEEK ENDING APRIL 18, 1871.

Reported Officially for the Scientific American.

SCHEDULE OF PATENT FEES:	
On each Caveat	$10
On each Trade-Mark	$25
On filing each application for a Patent, (seventeen years)	$15
On issuing each original Patent	$20
On appeal to Examiners-in-Chief	$10
On appeal to Commissioner of Patents	$20
On application for Reissue	$30
On application for Extension of Patent	$50
On granting the Extension	$50
On filing a Disclaimer	$10
On an application for Design (three and a half years)	$10
On an application for Design (seven years)	$15
On an application for Design (fourteen years)	$30

For Copy of Claim of any Patent issued within 30 years $1
A sketch from the model or drawing, relating to such portion of a machine as the Claim covers, from .... $1 *upward, but usually at the price above-named.*
The full Specification of any patent issued since Nov. 20, 1866 at which time the Patent Office commenced printing them .... $1·25
Official Copies of Drawings of any patent issued since 1836, we can supply at a reasonable cost, the price depending upon the amount of labor involved and the number of views.
Full information, as to price of drawings, in each case, may be had by addressing

MUNN & CO.,
Patent Solicitors. 37 Park Row, New York.

113,719.—WHIP RACK.—Robert J. Anderson, New York city.
113,720.—SMOOTHING AND RUFFLE IRON.—A. R. Armstrong and C. S. Dudley, Nashua, N. H.
113,721.—PAPER FILE, ETC.—Albert Baker, Appleton, Wis.
113,722.—TILE DITCHER.—Isaac T. Baker, Gratiot, Ohio.
113,723.—EXPANDING PULLEY.—George S. Barton (assignor to Rice Barton & Fales' Machine and Iron Company) Worcester, Mass.
113,724.—SEWING MACHINE.—William G. Beckwith, Newark, N. J.
113,725.—STEAM PUMP.—William Baxter, Jr., Newark, N. J.
113,726.—RULER ATTACHMENT FOR DRAWING-BOARDS.—Theodore Bergner (assignor to James W. Queen & Co.) Philadelphia, Pa.
113,727.—WASHING MACHINE.—Charles H. Berry, Natick, Mass.
113,728.—SHAFT COUPLING.—James H. Blessing (assignor to himself and Townsend & Jackson), Albany, N. Y.
113,729.—DOOR LATCH.—Eli S. Bitner, Lock Haven, Pa.
113,730.—CAR COUPLING.—Lycurgus J. Bosworth, Monmouth, Ill.
113,731.—TENONING MACHINE.—Melton S. Bourland, Buena Vista, Texas.
113,732.—CIDER MILL.—Jesse Bowen and Aaron T. Foster Clarksburg, Ohio.
113,733.—PLOW.—Walter Britton, Truro, assignor to himself and Elmwood Mining and Manufacturing Company, Elmwood, Ill.
113,734.—SHAWL STRAP.—Damon W. Brockway, Dover, Me.
113,735.—APPARATUS FOR COMPRESSING, STRAINING, AND MOLDING PLASTIC PYROXYLINE.—Josephus Brockway, Albany, N. Y. assignor to himself and Urial K. Mayo, Boston, Mass.
113,736.—MANUFACTURE OF DENTAL PLATE FROM PYROXYLINE.—Josephus Brockway, Albany, N. Y., assignor to himself and Urial K. Mayo, Boston, Mass.
113,737.—MACHINE FOR PUNCHING CORSET SPRINGS.—Peter Brooks, assignor to Carrington Manufacturing Company, Waterbury, Conn.
113,738.—MODE OF ATTACHING TOPMASTS AND TOP-GALLANT MASTS.—Leverett Brown, New York city.
113,739.—SELF-CENTERING BOX OR BEARING.—Milan C. Bullock, Pottsville, assignor to himself and S. E. Griscom, Mahanoy Plain, Pa.
113,740.—MACHINE FOR CUTTING SCREWS.—James M. Carpenter, Pawtucket, R. I.
113,741.—TABLE FOR SEWING AND KNITTING MACHINES.—Edwin Chesterman, Tremont, N. Y.
113,742.—COOKING STOVE.—Franklin Clement (assignor to C. H. Buck and W. S. Wright), St. Louis, Mo.
113,743.—MODE OF FORMING THE HEADS OF WRENCH BARS.—Aury G. Coes, Worcester, Mass.
113,744.—HANGER FOR REVOLVING SHAFTING.—A. B. Couch, Worcester, Mass.
113,745.—CUT-OFF FOR BLAST FURNACES.—Henry Davies, Newport, Ky.
113,746.—SHINGLE MACHINE.—James Decker (assignor to himself and F. McRae), Holmesville, Ga.
113,747.—CORN PLANTER.—J. Dyson Delap, Tyrone township, Pa.
113,748.—SCARF.—George R. Dexter, New York city.
113,749.—DIRT CHAMBER FOR GAS PIPES.—Martin N. Dial, Painesville, Ohio.
113,750.—HORSE POWER.—William W. Dingee, Racine, Wis.
113,751.—BOTTLE STOPPER.—Louis Dovell, Newark, N. J.
113,752.—DRAWING FRAME.—George Draper, Hopedale, Mass.
113,753.—FENCE.—James T. Drummond, Mount Pleasant, Iowa.
113,754.—DRYING BONE BLACK.—Peter Farley, New York city.
113,755.—COMPOSITION FOR PRINTING OR PAINTING ON SURFACES.—Alonzo Farrar, Brookline, Mass.
113,756.—SIGNAL FOR RAILROADS.—John Fogarty, Brooklyn, N. Y.
113,757.—FIREPLACE GRATE.—Wm. H. Garrett, Cannonsburg, Pa.
113,758.—ORNAMENTATION OF METAL, GLASS, ETC.—B. G. George, London, England.
113,759.—SCUTTLE FASTENING.—Thomas J. Gifford, Mass.
113,760.—REVOLVING MOLD BOARD FOR PLOWS.—Joseph S. Godfrey, Rochester, assignor to himself and Sears M. Loveridge, Pittsburgh, Pa.
113,761.—CHECK ROW ATTACHMENT FOR CORN PLANTERS.—Wm. C. Grimes, Decatur, Ill.
113,762.—WASHING MACHINE.—Julius W. Groat, Fremont Ohio.
113,763.—CHEESE PRESS.—Charles L. Haines, North New burg, Me. Antedated April 3, 1871.
113,764.—CALORIC ENGINE.—William T Halefas, New York city.
113,765.—CARPET LINING.—John R. Harrington, Brooklyn N. Y.
113,766.—PARLOR AIR PISTOL.—Benjamin Haviland, Hudson and George P. Gunn, Ilion, N. Y.
113,767.—TRACTION ENGINE.—John W. Hasen, West Hartford, Vt.
113,768.—CAR SPRING.—Albert Hebbard, Cambridge, Mass assignor to himself and John P. Onderdonk.
113,769.—PRINTING PRESS.—Richard M. Hoe, New York city
113,770.—GRAIN HULLING MACHINE.—Michael Hoffmann, Munich, Bavaria, assignor to Ludwig Kölbl, St. Louis, Mo.
113,771.—BARREL ROLLING APPARATUS.—Lewis L. Hyatt, New York, and Adolph G. Hüpfel, Morrisania, N. Y.
113,772.—APPLICATION OF BRONZE AND GILDING TO PLATE GLASS.—Elias Ingraham, Bristol, Conn.
113,773.—INNER SOLE FOR BOOTS AND SHOES.—Charles P. Johnson, Jamaica Plain, Mass.
113,774.—WASH BOILER.—O. L. Kenyon and E. B. Palmer, Rome, N. Y.
113,775.—SHIFTING TOP FOR BASKET PHAETONS.—Charles P. Kimball, Portland, Me.
113,776.—TREADLE.—George Byron Kirkham, New York city.
113,777.—MOP.—Milton W. Kirkwood and Solomon H. Riley, Iowa City, Iowa.
113,778.—COMBINED CIDER MILL AND PRESS.—Daniel H. Krauser (assignor to himself and Joseph C. Bright), Pottsville, Pa.
113,779.—MACHINE FOR MAKING WIRE CYLINDERS.—Cyrus H. Latham, Lowell, Mass.
113,780.—NECKTIE RETAINER.—Christopher P. Lawton (assignor to himself and Eben A. Day), Webster, Mass.
113,781.—CLOCK MOVEMENT.—B. B. Lewis (assignor to S. C. Spring), Bristol, Conn.
113,782.—PURIFICATION OF OILS AND FATS BY ACIDS.—R. G. Loftus, Chelsea, Mass.
113,783.—PLUMBAGO OIL CAN.—D. B. Mackay, Whitestone, and Cyrus Butler, New York city.
113,784.—SELF-ACTING JACK FOR SPINNING.—Peter McGovern, Lawrence, Mass., assignor to G. L. Davis, J. A. Wiley, Joseph M. Stone, G. G. Davis, J. H. Stone, and J. H. Davis.
113,785.—PIANO FORTE ACTION.—Frazee B. McGregor (assignor to himself and George A. Hoyt), Pontiac, Mich.
113,786.—LIQUID RECEPTACLE AND FUNNEL.—William H. Mumler, Boston, Mass.
113,787.—WATERPROOF FLOOR.—Tobias New, New York city.
113,788.—HINGE FOR GATES.—Edwin D. Norton, Cuba, N. Y.
113,789.—EXTENSION PULLEY.—William Onions and Isaac Bagnall, St. Louis, Mo.
113,790.—COOKING STOVE.—Daniel E. Paris, Troy, N. Y.
113,791.—AMALGAMATING PAN FOR GOLD AND SILVER ORES. Ira S. Parke, Virginia City, Nev.
113,792.—GRAIN BINDER.—Previze A. Perry, Perth Amboy, N.J.
113,793.—CEILING AND WALL FOR BUILDINGS.—Charles N. Poole, Sandwich, Ill.
113,794.—COUNTING REGISTER.—Charles W. Pile, Wilmington, Del.
113,795.—MACHINE FOR TURNING BARREL HEADS.—John Jackson Ralya, Cleveland, Ohio.
113,796.—CANT HOOK.—Albert B. Reeves, Knightstown, Ind.
113,797.—GUANO AND SEED DRILL.—Leonidas M. Rhodes, Warrenton, Ga.
113,798.—LATHE.—John F. C. Rider, South New Market, N.H., and Emerson P. Brownell, Providence, R.I. Antedated April 10, 1871.
113,799.—BRICK LIFTER.—K. Julius Rugg, Cincinnati, Ohio.
113,800.—PLANING TOOL.—Nathaniel Russell, Plymouth Mass.
113,801.—APPARATUS FOR CONVERTING ROTARY INTO RECIPROCATING MOTION BY MEANS OF FRICTION.—Richard Sammer, Vineland, N.J.
113,802.—HORSE COLLAR.—John W. Schwaner, Egg Harbor City, N.J.
113,803.—SOLDERING FURNACE.—Conrad Seimel, Green Point assignor to himself and J. Hubert Richardson, Brooklyn, N. Y.
113,804.—DUMPING CAR.—William A. Sharp, Tama City Iowa.
113,805.—FERRULE.—Dolphin G. Smith, Columbus, Ohio.
113,806.—MILKING STOOL.—George Smith, Rochester, N. Y.
113,807.—COOKING STOVE.—Samuel Smith (assignor to himself and Charles Noble & Co.), Philadelphia, Pa.
113,808.—HOOK FOR BIRD CAGES.—John M. Spring (assignor to P. & F. Corbin), New Britain, Conn.
113,809.—CHEESE HOOP.—William Sternberg, Bridgeport N.Y.

113,810.—Steam Engine Valve.—Nathan Page Stevens, Hopkinton, N.H.
113,811.—Petroleum Still.—John L. Stewart and John P. Logan, Philadelphia, Pa.
113,812.—Chair and Cradle Combined.—Edmund Stoney, Walkerton, Canada.
113,813.—Horse Hay Rake.—Ole O. Storle, North Cape, Wis. Antedated April 1, 1871.
113,814.—Self-acting Mule for Spinning.—James Sutherland, East Hampton, Mass.
113,815.—Drilling Machine.—George C. Taft, Worcester, Mass.
113,816.—Machine for making Pottery Ware.—Samuel R. Thompson, Portsmouth, N.H.
113,817.—Pound Net for Fishing.—Patrick E. Tiernan, Waukegan, Ill.
113,818.—Steam Engine.—Samuel D. Tillman, New York city.
113,819.—Corn Planter.—Granville J. Vaught, Hanly, Ky.
113,820.—Disinfecting Compound.—Guillaume Vigué, ainé, Bordeaux, France.
113,821.—Wardrobe and Book Case.—Ferdinand F. Voight, New Orleans, La.
113,822.—Lifter for Spittoon, etc.—James Walker and Henry F. Lilly, Philadelphia, Pa.
113,823.—Water Wheel.—John S. Warren, Fishkill-on-the-Hudson, N.Y.
113,824.—Shaping Machine.—William H. Warren (assignor to Aurin Wood and Joseph F. Light), Worcester, Mass.
113,825.—Comb for Combing Machines.—Charles Weiler (assignor to Martin Landenberger & Co.), Landenberger, Pa.
113,826.—Self-releasing Clutch for Water Wheels.—George W. Wesley, Meadville, Pa.
113,827.—Case for Ribbons, Laces, etc.—Samuel Whitaker, Macon, assignor to himself and Aaron Ruth, Decatur, Ill.
113,828.—Time Indicator for Offices.—Edwin A. Wood, Utica, N.Y.
113,829.—Automatic Relief Valve.—Albert F. Allen, Providence, R.I.
113,830.—Portable Roller for Moving Heavy Bodies.—John R. Anderson, New York city.
113,831.—Machine for Balling Oakum.—Samuel George Archibald, Edinburgh, North Britain.
113,832.—Apparatus and Process for treating Coffee.—John Ashcroft (assignor to Sarah Jane Ashcroft), Brooklyn, N.Y.
113,833.—Lamp Burner.—Lewis J. Atwood (assignor to The Plume & Atwood Manufacturing Company), Waterbury, Conn.
113,834.—Clasp Fastener for Bags, etc.—Alfred Holme Balch and Wolfred David Emelius Nelson, Montreal, Canada.
113,835.—Tongue and Groove Joint.—Richard Barton, New York city.
113,836.—Hoisting Machine.—James Bates, Baltimore, Md.
113,837.—Hay Elevator.—Thomas Vandolah Bayly, Jones' Station, Ind.
113,838.—Wooden Pavement.—George A. Beidler, Philadelphia, Pa.
113,839.—Rotary Engine.—Henry Leonard Bennison, Greenwich, England.
113,840.—Grain Dryer.—William Blakey, Brooklyn, N.Y.
113,841.—Friction Clutch for Belt Pulleys.—James H. Blessing (assignor to himself and Townsend & Jackson), Albany, N.Y.
113,842.—Cooking Stove.—Mary Ann Boughton, Bridgeport, Conn.
113,843.—Low Water Indicator.—William A. Bradford, Cincinnati, Ohio.
113,844.—Apparatus for making Extracts from Vegetable and Animal Matter.—Louis Brauer, Philadelphia, Pa.
113,845.—Broom.—Thomas E. C. Brinley, Louisville, Ky., assignor to Tyler, Brown & Co.
113,846.—Cooking Stove.—Dominicus Brix, Geneseo, Ill.
113,847.—Machine for making Bricks and Tiles.—Isaac C. Bryant, Washington D.C. Antedated April 8, 1871.
113,848.—Hay Tedder.—Hiram M. Burdick, Ilion, N.Y.
113,849.—Hay Tedder.—Hiram M. Burdick, Ilion, N.Y.
112,850.—Machinery for Drilling Rocks.—Charles Burleigh (assignor to "The Burleigh Rock-Drill Company"), Fitchburg, Mass.
113,851.—Carriage Wheel.—Garrett G. W. Burnham, Baltimore, Md., assignor to himself and James N. Burnham.
113,852.—Curtain Fixture.—William Campbell, New York city.
113,853.—Water Wheel and Chute.—Elisha P. H. Capron, Hudson, N.Y.
113,854.—Hoop Skirt.—Albert Carter (assignor to Charles C. Carpenter), New York city.
113,855.—Curculio Catcher.—Frank J. Claxton and Charles D. Stevens, St. Louis, Mo.
113,856.—Thimble Skein and Boxing.—Moris Collins, Decatur, Ill.
113,857.—Sectional Steam Boiler.—William H. Cornell, Easton, Pa.
113,858.—Spool Exhibiter.—John D. Cutter, Brooklyn, N.Y.
113,859.—Preparing Flour for Use in Conectionery, etc.—W. G. Dean, Brooklyn, N.Y.
113,860.—Lubricator for Journals.—P. S. Devlan, Jersey City, N.J.
113,861.—Corpse Preserver.—H. M. Diggins, Cincinnati, Ohio.
113,862.—Dish Rack.—W. H. Duffett, Rochester, N.Y.
113,863.—Machine for Piercing Leather.—Asa Eggleston, Fall River, Mass.
113,864.—Construction of Thermo-electric Pairs.—M.G. Farmer, Salem, Mass.
113,865.—Saw Mill.—W. M. Ferry, Grand Haven, Mich.
113,866—Saw Mill.—W. M. Ferry, Grand Haven, Mich.
113,867.—Bearing Step and Vertical Shaft.—Francis A. Gardner, Danbury, Conn.
113,868.—Device for Adjusting Mirrors.—O. L. Gardner and William Gardner, Glen Gardner, N.J.
113,869.—Lightning Rod.—A. A. Gaylord, East Cleveland, Ohio.
113,870.—Beehive.—Daniel Gebhart, Sallimonia, assignor to himself and Peter Weimer, Saratoga, Ind.
113,871.—Slide for Drawers.—J. S. Gibbons, Philadelphia, Pa.
113,872.—Fence Post.—Andrew J. Gill, Denver, Colorado Territory.
113,873.—Tenon Machine.—Wm. Gilmore (assignor to himself and H. Rogers), Hudson, N.J.
113,874.—Carpet Fastener.—Antoine Givaudan, Washington, D.C.
113,875.—Water Closet Valve.—Wm. Gordon (assignor to himself and Andrew McCambridge), Philadelphia, Pa.
113,876.—Lamp Burner.—W. H. Gray, St. Louis, Mo.
113,877.—Burglar-proof Safe.—Edward K. Hall, Louisville, Ky.
113,878.—Railway Car Truck.—Francis S. Harrington, Boston, Mass.
113,879.—Spring Roller Shade.—Stewart Hartshorn, New York city.
113,880.—Cigar Machine.—Issachar A. Heald, Lowell, Mass.
113,881.—Arched Structure.—Constantine Henderson, London, Eng., assignor to E. R. Hall, Philadelphia, Pa.
113,882.—Metal-clad Shingle.—T. N. Hickcox, Brooklyn, N.Y.
113,883.—Excavator.—Marcus M. Hodgman, Weymouth, Mass.
113,884.—Carriage Coupling.—Jacob Hollinger, Millersburg, Ohio.
113,885.—Machine for Reducing or Pointing Wire.—A. G. Hotchkiss, Wolcottville, Conn.
113,886.—Broiler.—W. T. Howard, Baltimore, Md.
113,887.—Hand Seed Sower.—Thomas Howell, Morgantown, W. Va.
113,888.—Water Wheel.—C. F. H. Huff, New York city.
113,889.—Peanut Huller.—Josee Johnson, New York city.
113,890.—Apparatus for Cleaning Coffee, etc.—Josee Johnson, New York city.
113,891.—Pipe for Water, Gas, etc.—A. K. Johnston, Brooklyn, N.Y.
113,892.—Beehive.—Campbell Jones and Albert Jones, Santa Anna, Ill.
113,893.—Dinner Pail.—H. Joyce and Anthony Ernest, Troy, N.Y.
113,894.—Steam Bath.—Charles Kaestner, Chicago, Ill.
113,895.—Double Tree.—David W. Kauffman, Sterling, Ill.
113,896.—Wagon Axle.—August Kessberger, Springfield, Ill.
113,897.—Steam Pump.—Lucien J. Knowles, Worcester, Mass.
113,898.—Machine for Molding Chair Backs.—John Lemman, Cincinnati, Ohio.
113,899.—Horse Hay Rake.—W. H. Locke, Canton, Ill.
113,900.—Cotton and Hay Press.—C. K. Marshall, New Orleans, La.
113,901.—Cotton Press and Tramper.—C. K. Marshall, New Orleans, La. Antedated April 10, 1870.
113,902.—Buckle.—John H. Martin, Columbus, Ohio.
113,903.—Hemming and Tucking Attachment for Sewing Machines.—W. N. Martin, Boston, Mass.
113,904.—Shade Cord Retainer.—William McConnell, Philadelphia, Pa.
113,905.—Combining Carbonaceous Matter for the Manufacture of Gas.—George McKenzie, Glasgow, Scotland.
113,906.—Revolving Gas Burner.—Frederick McLewee, New York city.
113,907.—Scroll Saw.—Louis Miller, Baltimore, Md.
113,908.—Fire Grate.—G. R. Moore, Philadelphia, Pa.
113,909.—Reversible Knob Latch.—W. T. Munger (assignor to P. & F. Corbin), New Britain, Conn.
113,910.—Door Lock.—W. T. Munger (assignor to P. & F. Corbin), New Britain, Conn.
113,911.—Apparatus for Vapor Bath.—G. F. Munro, Sr., Albany Mo.
113,912.—Type-setting and Distributing Machine.—F. M. Neff and John E. Scruggs, Monroe, Iowa.
113,913.—Sheave or Pulley Block.—Henry Nick, Paris, France. Antedated April 8, 1871.
113,914.—Machine for Dressing Millstones.—John Norman, Glasgow, Scotland, assignor to W. H. Howland.
113,915.—Brace for Carriage Springs.—D. W. Norris, Paxton, assignor to Michael Neill, Chatsworth, Ill.
113,916.—Gate for Draw Bridges.—Ferdinand Pairan (assignor to himself and Henry Myer), Dayton, Ohio.
113,917.—Machine for Dressing Worsted Cord.—Isaac E. Palmer, Hackensack, N.J.
113,918.—Product for Madder.—Alfred Paraf (assignor to E. S. Renwick, trustee), New York city.
113,919.—Composition of Madder for Printing Cloths, etc.—Alfred Paraf (assignor to E. A. Renwick, trustee), New York city.
113,920.—Wash Boiler.—H. W. Pell, Rome, N.Y.
113,921.—Earth Mattress.—T. Wm. Phinney, Newport, R.I.
113,922.—Forging Machine.—James Pipes, Ripley, W. Va.
113,923.—Fountain Brush.—Zephire Poitras (assignor to C. H. Merrill, F. G. Tanner, and A. W. Merrill), Chicago, Ill.
113,924.—Sleigh-runner Attachment to Wheel Vehicles.—Z. I. Pratt, Chicago, Ill.
113,925.—Bedstead Fastening.—Rezin M. Price, Leesville, Ohio.
113,926.—Sawing Machine.—Paul Pryibil, New York city.
113,927.—Machine for Cutting Cloth, etc.—W. Raeuchle, Philadelphia, Pa., assignor to himself, George Rex, and Abraham R. Bockins.
113,928.—Beehive.—D. R. Read, Lawrence, Kansas.
113,929.—Wood Pavement.—P. H. Reinhard and E. F. M. Faehtz, Washington, D.C.
113,930.—Sash Holder.—George W. Reisinger, Harrisburg, Pa.
113,931.—Car Door.—J. H. Robertson, New York city.
113,932.—Car Coupling.—W. B. Rogerson and Harvey Beyea, Paterson, N.J.
113,933.—Welding Powder for Iron, etc.—G. E. Rose, Philadelphia, Pa.
113,934.—Horse Hoe and Cultivator.—G. D. Rowell, Menomonee Falls, Wis.
113,935.—Shoemaker's Jack.—August Rust, Egg Harbor City, N.J.
113,936.—Corn Planter.—W. J. Sager, Milesburg, Pa.
113,937.—Percussion Match.—William Servant (assignor to himself and J. A. Whitman), Providence, R.I.
113,938.—Medical Compound or Bitters.—W. T. Sherwood, Ripon, Wis.
113,939—Belt Shifter.—W. H. H. Sisum, Newark, N.J.
113,940.—Reverberating Reed Cell for Organs or Melodeons.—C. W. Small, Worcester, Mass.
113,941.—Hat Ventilator.—Alden Solmens, New York city.
113,942.—Gas Condenser.—I. N. Stanley, Brooklyn, N.Y.
113,943.—Sawing Machine.—William Steschult, Glandorf, Ohio.
113,944.—Seaming Machine.—O. F. Stow, Plantsville, Conn.
113,945.—Hame for Harness.—James Thornton and E. G. Latta (assignors to James Thornton and James Macken), Wellsville, N.Y.
113,946.—Seal for Hydraulic Mains of Gas Works.—Samuel Trumbore, Easton, Pa.
113,947.—Printers' Ink.—Marshall Turley, Council Bluffs, Iowa.
113,948.—Washing Machine.—Foster Utley, Chapel Hill, N.C.
113,949.—Laundry Stove.—John Van, Cincinnati, Ohio.
113,950.—Road Scraper.—H. B. Van Voorhis, Pittsburgh, Pa.
113,951.—Propelling Canal Boats.—W. W. Virdin, Baltimore, Md.
113,952.—Cooking Range.—G. W. Walker, Boston, Mass.
113,953.—Turntable.—George Walters (assignor to Phœnix Iron Co.), Phœnixville, Pa.
113,954.—Barrel Filler.—L. H. Watson, Pittsburgh, Pa.
113,955.—Steam Generator.—Elijah Weston, Buffalo, N.Y.
113,956.—Steam Engine Valve.—S. H. Whitmore, Decatur, Ill.
113,957.—Neck Tie.—J. R. Wilber and O. W. Peirce, Providence, R.I.
113,958.—Fire Escape Ladder.—Tobias Witmer, Buffalo, N.Y.
113,959.—Machine for Turning Crank Pins.—M. G. Wood, Boston, Mass.
113,960.—Plow.—C. A. Beard and E. E. Evans, Zanesville, Ohio.

REISSUES.

4,342.—Combined Vapor Burner and Lamp Post.—B. D. Evans, Columbus, Ohio, assignor to J. W. Baker.—Patent No. 90,830, dated June 1, 1869.
4,343.—Clothes-wringing Hook.—J. H. Pratt (assignor to himself and B. F. Larabee), Lynn, Mass.—Patent No. 112,074, dated February 21, 1871.
4,344.—Hose Coupling.—J. C. Cooke, Bridgeport, Conn., assignor to A. F. Allen, Providence, R.I.—Patent No. 22,166, dated Nov. 30, 1858.
4,345.—Division A.—Feed Water Pipe.—John Doyle, Baltimore, Md., assignor to himself and Anthony Reybold, Delaware City, Del.—Patent No. 110,753, dated Jan. 3, 1871.
4,346.—Division B.—Feed Water Pipe.—John Doyle, Baltimore, Md., assignor to himself and Anthony Reybold, Delaware City, Del.—Patent No. 110,753, dated Jan. 3, 1871.
4,347.—Mold.—William Hainsworth, Allegheny City, assignor of one half interest to S. M. Loveridge, Pittsburgh, Pa.—Patent No. 109,894, dated Dec. 6, 1870.
4,348.—Suspender.—J. B. Sharp, New York city, and William Seymour, administrator of R. M. Seymour, deceased, Sing Sing, N.Y.—Patent No. 59,465, dated Nov. 6, 1866.

DESIGNS.

4,810.—Cooking Stove.—John Abendroth, New York city.
4,811.—Claw Bar.—David Christie, Chillicothe, Ohio.
4,812.—Bottle Stand.—George Gill (assignor to Reed & Barton), Taunton, Mass.
4,813.—Tea-pot.—George Gill (assignor to Reed & Barton), Taunton, Mass.
4,814.—Match Safe.—G. R. Hubbard, New York city, assignor to Bradley & Hubbard, West Meriden, Conn.
4,815.—Cooking Stove.—J. L. Kuechler (assignor to Orr, Painter & Co.), Reading, Pa.
4,816.—Stove.—J. H. Keyser, New York city.
4,817.—Oven.—J. H. Keyser, New York city.
4,818.—Parlor Stove.—John Martino and John Currie, Philadelphia, assignors to Orr, Painter & Co., Reading, Pa.
4,819.—Plate for Cooking Stoves.—Charles Noble (assignor to Charles Noble & Co.), Philadelphia, Pa.
4,820.—Type.—W. H. Page (assignor to W. H. Page & Co.), Norwich, Conn.
4,821.—Stove.—La Forist Rollins, Bangor, Me.
4,822.—Drawer Pull.—E. J. Steele, New Britain, assignor to Turner, Seymour & Judds, Wolcottville, Conn.
4,823.—Cooking Stove.—Jacob Steffe, Philadelphia, assignor to Orr, Painter & Co., Reading, Pa.
4,824.—Show Case.—J. D. Vredenburgh, Chicago, Ill.
4,825.—Cooking Stove.—George Wellhouse, Akron, Ohio.
4,826 and 4,827.—Stocking Fabric.—Thomas Dolan, Philadelphia, Pa. Two Patents.
4,828.—Talma or Cloak Garment.—Eberhard Flues, Fort Washington (Whitemarsh Post Office), Pa.
4,829 and 4,830.—Lamp Burner.—H. W. Hayden (assignor to Holmes, Booth & Haydens), Waterbury, Conn.
4,831.—Spoon or Fork Handle.—E. C. Moore, Yonkers, N.Y., assignor to Tiffany & Co., New York city.
4,832.—Pattern for Cutting Dress Waists.—E. P. Smith (assignor to herself and N. H. Sherburne), Chicago, Ill.
4,833.—Public Urinal and Water Closet.—F. J. Smith, Chicago, Ill.
4,834.—Steam Engine.—P. L. Weimer, Lebanon, Pa.
4,835.—Range.—C. J. Wood, Baltimore, Md.

TRADE-MARKS.

222.—Cassimeres.—Gallaghan & Brother, Philadelphia, Pa.
223.—Medicine.—Hostetter & Smith, Pittsburgh, Pa.
224.—Paint.—The Averill Chemical Paint Co., New York city, and Cleveland, Ohio.
225.—Cotton Goods.—The Harris Manufacturing Co., Coventry, R.I.
226.—Whiskey.—Vidvard & Shehan, Utica, N.Y.

EXTENSIONS.

Harrow.—S. S. Hogle, of Berea, Ohio.—Letters Patent No. 16,866, dated March 17, 1857; reissue No. 804, dated Aug. 30, 1859.
Automatic Lathe for Turning Irregular Forms.—W. D. Sloan, of New York city.—Letters Patent No. 16,936, dated March 31, 1857.
Machine for Composing and Distributing Type.—W. H. Houston, Peabody, Mass.—Letters Patent No. 16,947, dated March 31, 1857.
Rake to Grain Harvester.—Jearum Atkins, of Mokena, Ill.—Letters Patent No. 9,479, dated Dec. 21, 1852. [Extended by an act approved March 3, 1871, entitled "An act to amend an act for the relief of Jearum Atkins," approved July 15, 1870.]
Mill for Cleaning Castings.—H. R. Remsen, of Albany, N.Y.—Letters Patent No. 17,012, dated April 7, 1857.

Receipts—When money is paid at the office for subscriptions, a receipt for it will be given; but when subscribers remit their money by mail, they may consider the arrival of the first paper a *bona-fide* acknowledgment of their funds

Advertisements.

Advertisements will be admitted on this page at the rate of **$1·00** *per line for each insertion. Engravings may head advertisements at the same rate per line, by measurement, as the letter-press.*

NOTICE.

WILLIAM H. CHANDLER, Associate Editor of *The American Chemist*, and an instructor in Chemistry at the School of Mines of Columbia College, offers his services as a Chemical Expert, for the transaction of business of a Chemical nature in Europe, whither he will sail early in June. Address at the above named Institution, East 49th street, New York city.

The Great Improvement in Roofing.

H. W. JOHNS' IMPROVED

Asbestos Roofing

FIRST PREMIUM awarded by the AMERICAN INSTITUTE EXHIBITION of 1870.

Also manufacturer of ASBESTOS ROOF COATING, ASBESTOS CEMENT (for leaky roofs), ASBESTOS BOILER FELTING, ROOFING AND SHEATHING FELTS, BUILDING PAPER, and GENERAL ROOFING MATERIALS.

Full Descriptive Pamphlets, Price List, and Samples sent free. Address

H. W. JOHNS, Sole Manufacturer,
78 William street, New York,
Or, BARRETT, ARNOLD & KIMBALL, 124 LaSalle st., Chicago, Ill.

CORN HUSKERS.—CAUTION.

THE undersigned would state to the public that Patents granted to L. A. Aspinwall, April 12th, 1870, and subsequent reissues, claim all corn husking rollers having either longitudinal or spiral depressions.

Suits are now pending for interference, and until such decision we would caution manufacturers and others against investing in rights or machines which may prove worthless. GIFFORD & FAIRFIELD, Hudson, N.Y.

RAILROAD MEN, who hope for promotion, read the RAILROAD GAZETTE, published at 72 Broadway, New York, and 112 Madison st., Chicago. Sample numbers, 10 cts.

$2.50 A LINE for an advertisement in Kellogg's Inside Track List of 365 Western Country Newspapers. Best and cheapest medium of its kind in the world. Address A. N. KELLOGG, 110 and 112 Madison st., Chicago.

BAXTER'S PORTABLE STEAM ENGINES, Manufactured by Colt's Arms Co., Hartford, Conn., 2, 3, 5 and 10 Horse Powers, will be ready for delivery May 1st. For particulars, with price list, address RUSSELL & SPEER, 10 Park Place, New York.

SHORT HAND. 150 words per minute in four weeks. Send stamp for Circular. Prof. GRAY, P.O. Box 4847, N.Y.

VENEERS.

A. PARKER & CO.,
Nos. 166 and 168 Center st., cor. Canal, NEW YORK,

DEALERS in Foreign and Domestic Cabinet Woods, in Boards, Planks and Veneers, have a large and choice assortment, to which they invite the attention of Manufacturers and Dealers.

STEAM ENGINES,

CASTINGS, Forgings, and Machinery of all kinds. Address FISHKILL LANDING MACHINE CO., Fishkill-on-the-Hudson, N.Y.

SCHOOL of practical Civil Engineering, Surveying and Drawing, Reynold's Block, Chicago, Ill. Fits students for R. R. field work in 3 to 6 months; thorough course, 1 year. Send for Circular.

MACHINERY.—SHAFTING PULLEYS and Hangers, Paper Box and Paper Collar Machines, Machines for Plaiting Bosoms, an improved apparatus for running Sewing Machines by power, Brothers' Patent Self-operating Spinning Jack Attachment, Models, and Experimental Machinery. W. H. TOLHURST, Machine Shop No. 7, 9 & 11 Union Building, Troy, N.Y.

TO ALL WHO BUILD. BUILDERS AND CARPENTERS. Beautiful plans for dwelling houses, and large sheets of detail drawings, in each number of the **American Builder.** Only $3.00 a year. Send one dollar and try it for four months. CHARLES D. LAKEY, Publisher, Chicago, Ill.

L. L. SMITH & CO.,

Nickel Platers,

6 HOWARD ST., New York,
Between Elm and Centre.

PATENT COLD ROLLED SHAFTING.

The fact that this Shafting has 75 per cent greater strength, a finer finish, and is truer to gage, than any other in use, renders it undoubtedly the most economical. We are also the sole manufacturers of the CELEBRATED COLLINS PAT. COUPLING, and furnish Pulleys, Hangers, etc., of the most approved styles. Price Lists mailed on application to JONES & LAUGHLINS, 120 Water street, Pittsburgh, Pa.

☞ Stocks of this Shafting in store and for sale by FULLER, DANA & FITZ, Boston, Mass. GEO. PLACE & CO., 126 Chambers street, N. Y.

UNION

Spoke Works.

SPOKES, RIMS, AND PLOW HANDLES. All goods warranted seasoned, and of the best quality. JOHN G. DAVIS & SON, Southwest cor. of Leonard and Otter sts., Philadelphia.

WATER-PROOF

BUILDING PAPER

(NO TAR), for Roofing, Sheathing, Ceilings, Oil-cloths, Shoe Stiffenings, Tags, Trunks, Cartridges, Blasting, Pass-book Covers, Grain and Flour Bins, etc., for sale by J. HUNTER, JR., Paper Warehouse, 59 Duane st., New York.

FREEMAN & BURR,

SPRING CLOTHING | 138 & 140 Fulton St., New York. | SPRING CLOTHING

FREEMAN & BURR have very great pleasure in inviting an inspection of their immense Stock for the present season. It embraces the choicest products of the Loom from every part of the world, both in the piece and made up for immediate wear, for all ages and all occasions.

SPRING OVERCOATS, $5—$10. SUITS, $10—$15. BOYS' SUITS, $5—$8.
SPRING OVERCOATS, $15—$20. SUITS, $20—$30. BOYS' SUITS, $10—$12.
SPRING OVERCOATS, $25—$30. SUITS, $40—$50. BOYS' SUITS, $15—$20.

ORDERS BY LETTER promptly filled. FREEMAN & BURR'S Easy and Accurate System for SELF-MEASURE enables parties in any part of the country to order Clothing direct from them, with the certainty of receiving the most PERFECT FIT attainable.

RULES FOR SELF-MEASURE, Samples of Goods, Price List, and Fashion Sheet, SENT FREE on application.

An Important Fact.

MARVIN & CO.'S

SPHERICAL SAFES

Have never been Robbed.

Hundreds are in use by Banks, Bankers, and Merchants.

Warehouses, 265 Broadway, New York. 721 Chestnut st., Philadelphia. 108 Bank st., Cleveland. 93 Main st., Buffalo.

STEAM ENGINES & BOILERS

From 4 to 500 horse power including Corliss Engines, Slide Valve Stationary Engines, Porable Engines, etc. Also, Circular Saw Mills, Shafting, Pulleys, etc. Wheat and Corn Mills, Circular Saws, etc.

Send for Price List.

WOOD & MANN Steam Engine Company, WORKS—UTICA, N.Y.

PRINCIPAL OFFICE—42 Cortlandt st., New York.

POWER PLEDGED
Equal to any Overshot, with
N. F. BURNHAM'S
NEW TURBINE
WATER WHEEL.

Illustrated Descriptive Pamphlet and Price List sent free, by N. F. BURNHAM, York, Pa.

WIRE ROPE.

JOHN A. ROEBLING'S SONS,
MANUFACTURERS, TRENTON, N. J.

FOR Inclined Planes, Standing Ship Rigging, Bridges, Ferries, Stays, or Guys on Derricks & Cranes, Tiller Ropes, Sash Cords of Copper and Iron, Lightning Conductors of Copper. Special attention given to hoisting rope of all kinds for Mines and Elevators. Apply for circular, giving price and other information. Send for pamphlet on Transmission of Power by Wire Ropes. A large stock constantly on hand at New York Warehouse, No. 117 Liberty street.

American Saw Co., Manufacturers of

And Perforated Circular and Long Saws. Also Solid Saws of all kinds. No. 1 Ferry st., cor. Gold street, New York. Branch Office for Pacific Coast, No. 606 Front street, San Francisco, Cal.

Hard Wood Boards
AND
SPANISH CEDAR
FOR CIGAR BOXES,
And a large and magnificent assortment o.

VENEERS,

Comprising everything in their line, both Foreign and Domestic, to which they invite the special attention of all dealers. Send for Catalogue and Price List.

GEO. W. READ & CO.,
Factory, 291 Monroe st. 398 Madison st. 168, 170, and 172, Center st., New York city.

LeCOUNT'S PATENT Lathe Dogs & Clamps,
Of both Iron and Steel.
LeCount's Patent
EXPANDING MANDREL,
For use in the Lathe.
Send for latest Circular.
C. W. LeCOUNT,
South Norwalk, Conn.

THE CHEAPEST MODE OF INTRODUCING INVENTIONS.

INVENTORS AND CONSTRUCTORS OF new and useful Contrivances, or Machines, or Engineering works, of whatever kind, can have their Inventions illustrated and described in the columns of the SCIENTIFIC AMERICAN, on payment of a reasonable charge.

The cuts are furnished to the party for whom they are executed as soon as they have been used. We wish it understood, however, that no second-hand or poor engravings, such as patentees often get executed by inexperienced artists for printing circulars and handbills, can be admitted into the reading columns. We also reserve the right to accept or reject such subjects as are presented for publication. And it is not our desire to receive orders for engraving and publishing any but good Inventions or Machines, and such as do not meet our approbation we shal respectfully decline. Estimates as to cost of engraving and publication will be given, on receipt of photograph, model, or drawing, and description.

For further particulars address

MUNN & CO.,
Publishers of SCIENTIFIC AMERICAN,
New York city.

PRATT'S ASTRAL OIL — **Safest AND Best.** — OIL HOUSE CHS PRATT 1770 1871

IRON STEAMSHIP BUILDERS.

NEAFIE & LEVY,

PENN WORKS,
MARINE ENGINES, BOILERS, ETC.,
PHILADELPHIA, PA.

Vertical & Horizontal CORN MILLS.
30-inch grinds 30 bus. per hour, and 20-in. 15. Price $280 and $140. EDWARD HARRISON, New Haven, Conn.

L. W. Pond---New Tools.

EXTRA HEAVY AND IMPROVED PATTERNS.

LATHES, PLANERS, DRILLS, of all sizes. Vertical Boring Mills, ten feet swing, and under. Milling Machines, Gear and Bolt Cutters; Hand Punches and Shears for Iron.

Office and Warerooms, 98 Liberty st., New York; Works at Worcester, Mass.

A. C. STEBBINS, New York, Agent.

BUILDING PAPER
OF THREE GRADES.

TARRED SHEATHING,
For outside of Studding, under Clapboards. A non-conductor of cold, heat, and dampness.

PREPARED PLASTERING BOARD,
a cheap and perfect substitute for lath and plaster; makes a smooth, warm, and substantial wall, at less than half the usual cost.

DOUBLE THICK ROOFING
and Quartz Cement, make a good water and fire-proof roof, for less than $3.50 per square.

Sample and Circulars sent free, by ROCK RIVER PAPER CO., Chicago; or B. E. HALE, 22 & 24 Frankfort street, N. Y.

Patents on Designs.

Citizens and aliens can now secure design patents for three and a half, seven, and fourteen years. The law on this subject is very liberal. Foreigners, designers, and manufacturers, who send goods to this country, may secure patents nere upon their new patterns, and thus prevent other makers from selling similar goods in this market.

These patents cover all novelties of form or configuration of articl of manufacture.

For further information address

MUNN & CO.,
No. 37 Park Row, New York.

THE
Allen Engine Works
THE ALLEN ENGINE.

Fourth avenue and 130th and 131st sts. New York city Manufacturers of

Porter's Governor,
The Allen Boiler, and
Standard Straight Edges, Surface Plates, and Angle Plates.

Four first premiums were awarded to us at the Fair of the American Institute, 1870.

Send for our illustrated circular.

THE
Tanite Emery Wheel.
Does not Glaze, Gum, Heat, or Smell. Address THE TANITE CO., Stroudsburg, Monroe Co., Pa.

PAT. SOLID EMERY WHEELS AND OIL STONES, for Brass and Iron Work, Saw Mills, and Edge Tools. Northampton Emery Wheel Co. Leeds, Mass.

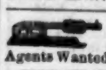
HEAVY CASTINGS For Forge and Mill Work. The M. & T. SAULT CO Steam Engine Builders & Founders, New Haven, Conn.

SCHLENKER'S PATENT
BOLT CUTTER
NEW INVENTION. ADDRESS,
HOWARD IRON WORKS, BUFFALO, N.Y.

EMPLOYMENT.
$250 A MONTH with Stencil Dies. Samples free. Address S. M. SPENCER Brattleboro Vt.

Steam Super-Heater,

FOR Saving Fuel, and supplying Dry Steam of any desired temperature. Safe, durable, easily attached. H. W. BULKLEY Engineer, 98 Liberty st., N.Y.



BEST DAMPER REGULATOR for Steam Boiler. Send for Circulars Agents Wanted. MURRILL & KEIZER, Baltimore, Md.

SEND to CLARKE REEVES & CO., Engineers, Builders of New Bridges, Viaducts, Roofs, etc., PHŒNIXVILE BRIDGE WORKS, of Pennsylvania. See their new *Album of Designs.* Address 410 Walnut st., Phila.

SPERM OIL, *strictly pure*, for SEWING MACHINES and fine Machinery, in bottles, cans, barrels, and casks. W. F. NYE, New Bedford, Mass.

☞ T. V. Carpenter, Advertising Agent. Addres hereafter, Box 773, New York city.

Harrison *Safety Boiler.*

First-class Medal, World's Fair, London, 1862. And American Institute Fair, New York, 1869.

Over 1,000 Boilers in Use.

Weston's Patent Differential

PULLEY BLOCKS.

75,000 IN USE.

Address HARRISON BOILER WORKS, Philadelphia, Pa. or, JOHN A. COLEMAN, Agent, 110 Broadway, New York, and 139 Federal st., Boston.

RUMPFF & LUTZ,

IMPORTERS and Manufacturers of Aniline Colors and Dyestuffs, Colors for Paperhangers and Stainers. Reliable recipes for Dyeing and Printing on Silk, Wool, and Cotton. All new improvements in the art of Dyeing, and new Colors are transmitted to us by our friends in Europe, as soon as they appear. 42 Beaver street, New York.

Engines, Tools, Machinery, etc.,
FOR SALE AT THE

Novelty Iron Works,

Foot of East 12th street, New York city,

EMBRACING Engines, Planers, Lathes, Smith and Boiler Makers' Tools, and Machinery and Patterns of the most approved kinds, etc. Also, 1 High Pressure Engine, 12-inch diameter by 30-inch stroke; 2 Stevenson's Patent Turbine Water Wheels, 66-inch diameter, and 1 Marine Beam Engine, 60-inches by 10-feet stroke. Send for catalogue.

JNO. S. SCHULTZE,
RECEIVER OF THE NOVELTY IRON WORKS.
New York, March 1, 1871.

Swain Turbine.

"Our Low-Water Wheel from this on"

WILL DO TEN PER CENT MORE WORK on small streams, in a dry season, than any wheel ever invented. Gave the best results, in every respect, at the Lowell Tests.

For Report of tests at Lowell, with Diagrams and Tables of Power, address

THE SWAIN TURBINE CO.,
North Chelmsford, Mass.

A. S. & J. GEAR & CO., Boston, furnish every description of Wood and Iron Working Machinery and Supplies. The best in use, regardless of maker, at lowest possible rates.

Patent Vertical Portable Engine.

Our guarantee is—more steam, less fuel, stronger in running, safer to run, less friction, and more durable, than any Old Style Portable, with Engine on Boiler, of same dimensions. Our Saw Mills are strong and well made—Lever Head Blocks, with Patent Roller set; quick setting, and correct when sawing. Stationary Engines and Boilers. Address GRIFFITH & WEDGE, Zanesville, Ohio.

STENCIL TOOLS and Stock.—Best in the world. L. S. METCALF, 117 Hanover st., Boston, Mass.

Working Models

And Experimental Machinery, Metal, or Wood, made to order, by J. F. WERNER 62 Center st. N.Y.

HOTCHKISS BRICK AND TILE MACHINE.—Send for Circular to Room 7, No. 19 Cliff street, New York.

IRON PLANERS, ENGINE LATHES Drills, and other Machinists' Tools, of superior quality, on hand, and finishing. For sale low. For Description and Price address NEW HAVEN MANUFACTURING CO New Haven Conn.

Scientific American *For 1871.*

TWENTY-SIXTH YEAR.

EVERY NUMBER is printed on fine paper, and elegantly illustrated with original engravings representing

New Inventions, Novelties in Mechanics Manufactures, Chemistry, Photography, Architecture. Agriculture. Engineering, Science, and Art.

Farmers, Mechanics, Inventors, Engineers, Chemists Manufacturers and People of all Professions or Trades will find the

SCIENTIFIC AMERICAN

of great value and interest.

The Editors are assisted by many of the ablest American and European Writers, and having access to all the leading Scientific and Mechanical Journals of the world, the columns of the SCIENTIFIC AMERICAN are constantly enriched with the choicest Information.

An Official List of all the Patents Issued is published Weekly.

The Yearly Numbers of the SCIENTIFIC AMERICAN make two splendid Volumes of nearly ONE THOUSAND PAGES equivalent in size to FOUR THOUSAND ordinary book pages.

SPECIMEN COPIES SENT FREE.

TERMS—$3·00 a year, $1·50 half year; Clubs of Ten Copies for one year, at $2·50 each, $25·00,

With a SPLENDID PREMIUM to the person who forms the Club, consisting of a copy of the celebrated Steel Plate Engraving, "Men of Progress."

Address

MUNN & CO.,
PUBLISHERS OF THE SCIENTIFIC AMERICAN,
37 Park Row, New York.

THE "Scientific American" is printed with CHAS. ENEU JOHNSON & CO.'S INK. Tenth and Lombard sts. Philadelphia, and 59 Gold st. New York